LIST OF PERIODICALS AND REPORTS EXAMINED BY THE COMMONWEALTH BUREAU OF PASTURES AND FIELD CROPS

FEBRUARY, 1956

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TITLE	ABBREVIATION USED
AFRICA	
Agronomia Angolana	*Agron. angol.*
Annales de l'Institut Agricole et des Services de Recherches d'Expérimentation Agricole de l'Algérie	*Ann. Inst. agric. Algér.*
Boletim Cultural da Guiné Portuguesa	*Bol. cult. Guiné portug.*
Bulletin Agricole du Congo Belge	*Bull. agric. Congo belge*
Bulletin d'Information de l'Institut National pour l'Étude Agronomique de Congo Belge	*Bull. inform. I.N.É.A.C.*
Bulletin de l'Institut d'Études Centrafricaines	*Bull. Inst. centrafr.*
East African Agricultural Journal	*E. Afr. agric. J.*
Farm and Forest	*Fm and For.*
Farming in South Africa	*Fmg in S. Afr.*
Journal of the Botanical Society of South Africa	*J. bot. Soc. S. Afr.*
Journal of South African Botany	*J. S. Afr. Bot.*
Kenya Information Office Fortnightly	*K. I. O. Fortnightly*
Monthly Bibliographical Bulletin	*Mon. bibl. Bull.*
Nigeria Trade Journal	*Niger. Tr. J.*
Nyasaland Agricultural Quarterly Journal	*Nyasald agric. quart. J.*
Nyasaland Farmer and Forester	*Nyasald Fmr For.*
Onderstepoort Journal of Veterinary Research	*Onderstepoort J. vet. Res.*
Proceedings and Transactions of the Rhodesia Scientific Association	*Proc. Rhod. sci. Ass.*
Quarterly Journal of the Royal Agricultural Society of Kenya	*Quart. J. roy. agric. Soc. Kenya*
Research Review	*Res. Rev.*
Rhodesia Agricultural Journal	*Rhod. agric. J.*
Sols Africains (8)	*Sols afr.*
South African Journal of Science	*S. Afr. J. Sci.*
Tanganyika Notes and Records	*Tanganyika Notes*
Terre Marocaine (2)	*Terre maroc.*
Transactions of the Royal Society of South Africa	*Trans. roy. Soc. S. Afr.*
Reports	
Rapport de l'Inspection Général de l'Agriculture. Afrique Occidentale Française	*Rapp. Insp. gén. Agric. A.O.F.*
Rapport de l'Inspection Général de l'Agriculture du Conseil de l'Experimentation et des Recherches Agronomiques. Algeria	*Rapp. Insp. gén. Agric. Cons. Exp. Rech. agron., Algér.*
Rapport de l'Institut National pour l'Étude Agronomique du Congo Belge	*Rapp. I.N.É.A.C.*
Rapport de l'Institut de la Recherche Scientifique de l'Afrique Centrale	*Rapp. I.R.S.A.C.*
Record of Investigations. Department of Agriculture. Uganda	*Rec. Invest. Dep. Agric. Uganda*
Report of African Land Development	*Rep. Afr. Ld Devel.*
Report of the Department of Agricultural and Veterinary Services. Somaliland	*Rep. Dep. agric. vet. Servs. Somalild*
Report of the Department of Agrculture. Basutoland	*Rep. Dep. Agric. Basutold*
Report of the Department of Agriculture. Bechuanaland	*Rep. Dep. Agric. Bechuanald*
Report of the Department of Agriculture. Gold Coast	*Rep. Dep. Agric. Gold Cst*
Report of the Department of Agriculture. Kenya	*Rep. Dep. Agric. Kenya*
Report of the Department of Agriculture. Nigeria	*Rep. Dep. Agric. Nigeria*
Report of the Department of Agriculture. Northern Rhodesia	*Rep. Dep. Agric. N. Rhod.*

*The term periodicals as used here includes: journals, proceedings, transactions, memoirs, reviews and yearbooks. Occasional bulletins and circulars are not included in the list. For key to asterisks and numbers in brackets, see back page.

AFRICA—(*Continued*)

Report of the Department of Agriculture. Nyasaland	*Rep. Dep. Agric. Nyasald*
Report of the Department of Agriculture. Sierra Leone	*Rep. Dep. Agric. Sierra Leone*
Report of the Department of Agriculture. Somaliland	*Rep. Dep. Agric. Somalild*
Report of the Department of Agriculture. Swaziland	*Rep. Dep. Agric. Swazild*
Report of the Department of Agriculture. Tanganyika Territory	*Rep. Dep. Agric. Tanganyika*
Report of the Department of Agriculture. Uganda	*Rep. Dep. Agric. Uganda*
Report of the Department of Agriculture and Lands. Southern Rhodesia	*Rep. Dep. Agric. Lds. S. Rhod.*
Report of the Department of Animal Health. Gold Coast	*Rep. Dep. Anim. Hlth. Gold Cst*
Report of the Department of Native Land Settlements. Swaziland	*Rep. Dep. Native Ld Settlem. Swazild*
Report of the Department of Reclamation and Tsetse Survey. Tanganyika	*Rep. Dep. Reclam. Tsetse Surv. Tanganyika*
Report of the Department of Veterinary Science and Animal Husbandry. Tanganyika	*Rep. Dep. vet. Sci. Tanganyika*
Report of the Department of Veterinary Services. Bechuanaland	*Rep. Dep. vet. Servs. Bechuanald*
Report of the Department of Veterinary Services and Animal Industry. Uganda	*Rep. Dep. vet. Servs, anim. Industr. Uganda*
Report of the Director of Research and Specialist Services. Southern Rhodesia	*Rep. Dir. Res. S. Rhod.*
Report of the East African Agricultural Research Station. Amani	*Rep. E. Afr. agric. Res. Sta.*
Report of the East African Agriculture and Forestry Research Organization	*Rep. E. Afr. agric. Res. Org.*
Report of the East African Veterinary Research Organization	*Rep. E. Afr. vet. Res. Org.*
Report of the Frankenwald University Field Research Station	*Rep. Frankenwald Fld Res. Sta.*
Report of the Grasslands Research Station. Marandellas	*Rep. Grassl. Res. Sta., Marandellas*
Report of the Ministry of Agriculture, Research Division. Sudan	*Rep. Minist. Agric., Res. Div. Sudan*
Report of the National Botanic Gardens. Kirstenbosch	*Rep. bot. Gdns, Kirstenbosch*
Report of the Northern Research Station. Samaru	*Rep. North. Res. Sta., Samaru*
Report of the Sudan Gezira Board	*Rep. Sudan Gezira Bd*
Report of the Tanganyika Sisal Growers' Association	*Rep. Tanganyika Sisal Gr. Ass.*
Report of the West African Maize Rust Research Unit	*Rep. W. Afr. Maize Rust Res. Unit*
Report of the West African Rice Research Station. Rokupr	*Rep. W. Afr. Rice Res. Sta., Rokupr*
Veterinary Report of the Department of Agriculture. Kenya	*Vet. Rep. Dep. Agric. Kenya*

AUSTRALIA

Abstracts of Published Papers and List of Translations of the Commonwealth Scientific and Industrial Research Organization	*Abstr. Publ. Pap. List Trans. C.S.I.R.O.*
Agricultural Gazette of New South Wales	*Agric. Gaz. N.S.W.*
Aqua. Victoria	*Aqua, Vict.*
Australian Journal of Agricultural Research	*Aust. J. agric. Res.*
Australian Journal of Biological Science	*Aust. J. biol. Sci.*
Australian Journal of Botany	*Aust. J. Bot.*
Australian Journal of Experimental Biology and Medical Science	*Aust. J. exp. Biol. med. Sci.*
Australian Journal of Science	*Aust. J. Sci.*
Australian Journal of Scientific Research. Series B.	*Aust. J. sci. Res. Ser. B.*
Australian Veterinary Journal	*Aust. vet. J.*
Commonwealth Agriculturist	*Commonw. Agriculturist*
Contributions from the New South Wales National Herbarium	*Contr. N.S.W. Herbarium*
Journal of the Australian Institute of Agricultural Science	*J. Aust. Inst. agric. Sci.*
Journal of the Department of Agriculture of South Australia	*J. Dep. Agric. S. Aust.*
Journal of the Department of Agriculture of Victoria	*J. Dep. Agric. Vict.*
Journal of the Department of Agriculture of Western Australia	*J. Dep. Agric. W. Aust.*
Journal and Proceedings of the Royal Society of New South Wales	*J. roy. Soc. N.S.W.*
Journal of the Soil Conservation Service of New South Wales	*J. Soil Conserv. N.S.W.*
Papers of the Queensland University Department of Botany	*Pap. Qd Univ. Dep. Bot.*

TITLE	ABBREVIATION USED
AUSTRALIA—(*Continued*)	
Papers of the Queensland University Faculty of Agriculture	*Pap. Qd Univ. Fac. Agric.*
Pastoral Review and Grazier's Record	*Pastoral Rev.*
Proceedings of the Linnean Society of New South Wales (7)	*Proc. Linn. Soc. N.S.W.*
Proceedings of the Royal Society of Queensland	*Proc. roy. Soc. Qd*
Quarterly Review of Agricultural Economics	*Quart. Rev. agric. Econ.*
Queensland Agricultural Journal	*Qd agric. J.*
Queensland Journal of Agricultural Science	*Qd J. agric. Sci.*
Rural Research in the Commonwealth Scientific and Industrial Research Organization	*Rur. Res. C.S.I.R.O.*
Tasmanian Journal of Agriculture	*Tasm. J. Agric.*
Transactions of the Royal Society of South Australia (7)	*Trans. roy. Soc. S. Aust.*
Reports	
Report of the Australian and New Zealand Association for the Advancement of Science	*Rep. Aust. Ass. Adv. Sci.*
Report of the Commonwealth Scientific and Industrial Research Organization	*Rep. C.S.I.R.O.*
Report of the Department of Agriculture. New South Wales	*Rep. Dep. Agric. N.S.W.*
Report of the Department of Agriculture. South Australia	*Rep. Dep. Agric. S. Aust.*
Report of the Department of Agriculture and Stock. Queensland	*Rep. Dep. Agric. Stock. Qd*
Report of the Minister of Agriculture for South Australia	*Rep. Minist. Agric. S. Aust.*
Report of the Soil Conservation Authority. New South Wales	*Rep. Soil Conserv. Auth. N.S.W.*
Report of the Waite Agricultural Research Institute. Glen Osmond	*Rep. Waite Agric. Res. Inst.*
AUSTRIA	
Bericht über die Arbeitstagung. Admont	*Ber. Arbstag., Admont*
Bodenkultur	*Bodenkultur*
Landwirtschaftliche Presse-Umschau	*Landw. Pr.-Umsch.*
Pflanzenschutzberichte (3)	*PflSchBer.*
Veröffentlichungen der Bundesanstalt für Alpine Landwirtschaft. Admont	*Veröff. Bundesanst. alp. Landw., Admont*
Versuchsergebnisse der Bundesanstalt für Alpine Landwirtschaft. Admont	*VersErgebn. Bundesanst. alp. Landw., Admont*
AZORES	
Comissão Reguladora dos Cereais do Arquipélogo dos Acores (8)	*Com. Reg. Cer. Arq. Acores*
BELGIUM	
Agricultura. Louvain	*Agricultura, Louvain*
Annales de Gembloux	*Ann. Gembl.*
Bulletin du Comité National Belge de la F.A.O.	*Bull. Cté nat. belge F.A.O.*
Bulletin de l'Institut Agronomique et des Stations de Recherches de Gembloux	*Bull. Inst. agron., Gembl.*
Bulletin du Jardin Botanique de l'État á Bruxelles	*Bull. Jard. bot., Brux.*
Communications. Centre de Recherches Écologiques et Phytosociologiques de Gembloux	*Commun. Cent. Rech. écol., phytosociol., Gembl.*
Compte Rendu de Recherches. Institut pour l'Encouragement de la Recherche Scientifique. Bruxelles	*C. R. Inst. Encour. Rech. sci., Brux.*
Mededeling van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent	*Meded. LandbHogesch., Gent*
Publications Techniques de l'Institut Belge pour l'Amélioration de la Betterave	*Publ. tech. Inst. belge Amélior. Better.*
Publications de Vulgarisation de l'Institut Belge pour l'Amélioration de la Betterave	*Publ. Vulg. Inst. belge Amélior. Better.*
Revue de l'Agriculture. Bruxelles	*Rev. Agric., Brux.*

BELGIUM—(*Continued*)

Reports

Rapports de l'Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture. Centre National de Recherches Herbagères et Fourragères	*Rapp. Inst. sci. Industr. Agric.*
Verslag aan het I.W.O.N.L. over de Onderzoekingen uitgevoerd. Gent	*Versl. I.W.O.N.L. Onderz., Gent*

BERMUDA

Report of the Department of Agriculture. Bermuda	*Rep. Dep. Agric. Bermuda*

BURMA

Report of the Department of Agriculture. Burma	*Rep. Dep. Agric. Burma*
Season and Crop Report of the Department of Agriculture. Burma	*Seas. Crop Rep. Burma*

CANADA

Agricultural Institute Review	*Agric. Inst. Rev.*
Agriculture, Montréal	*Agriculture, Montréal*
Canada Handbook	*Canad. Handb.*
Canadian Journal of Agricultural Science	*Canad. J. agric. Sci.*
Canadian Journal of Botany	*Canad. J. Bot.*
Canadian Journal of Microbiology	*Canad. J. Microbiol.*
Canadian Journal of Physics	*Canad. J. Phys.*
Canadian Journal of Technology	*Canad. J. Technol.*
Canadian Journal of Zoology	*Canad. J. Zool.*
Monthly Crop Report. Toronto	*Mon. Crop Rep., Toronto*
Monthly Dairy Report. Toronto	*Mon. Dairy Rep., Toronto*
Revue d'Oka	*Rev. Oka*
Transactions of the Royal Society of Canada	*Trans. roy. Soc. Canad.*

Reports

Report of the Canadian Seed Growers' Association	*Rep. Canad. Seed Gr. Ass.*
Report of the Department of Agriculture. Alberta	*Rep. Dep. Agric. Alberta*
Report of the Department of Agriculture. British Columbia	*Rep. Dep. Agric. Brit. Columbia*
Report of the Department of Agriculture. Canada	*Rep. Dep. Agric. Canad.*
Report of the Department of Agriculture. New Brunswick	*Rep. Dep. Agric. N. Brunswick*
Report of the Department of Agriculture. Ontario	*Rep. Dep. Agric. Ont.*
Report of the Department of Agriculture. Ottawa	*Rep. Dep. Agric. Ottawa*
Report of the Department of Agriculture. Prince Edward Island	*Rep. Dep. Agric. Pr. Edw. I.*
Report of the Department of Agriculture. Saskatchewan	*Rep. Dep. Agric. Saskatch.*
Report of the Department of Planning and Development. Ontario	*Rep. Plann. Devel. Ont.*
Report of the Dominion Agrostologist	*Rep. Dom. Agrostologist*
Report of the Dominion Bureau of Statistics	*Rep. Dom. Bur. Stat.*
Report of the Dominion Cerealist	*Rep. Dom. Cerealist*
Report of the Dominion Experimentalist in Charge of Experimental Sub-Stations	*Rep. Dom. Experimentalist*
Report of the Dominion Field Husbandryman	*Rep. Dom. Fld Husbm.*
Report of the Dominion Horticulturist	*Rep. Dom. Horticulturist*
Report of the Minister for Agriculture. Canada	*Rep. Minist. Agric. Canad.*
Report of the National Research Council. Ottawa	*Rep. nat. Res. Coun. Ottawa*
Report of the Quebec Society for the Protection of Plants	*Rep. Quebec Soc. Protect. Pl.*

CEYLON

Tropical Agriculturist	*Trop. Agriculturist*

Report

Report of the Director of Agriculture. Ceylon	*Rep. Dir. Agric. Ceylon*

TITLE	ABBREVIATION USED
CHINA	
Agricultural Research (Taiwan Agricultural Research Institute)	*Agric. Res., Taiwan*
Bulletin of the Taiwan Agricultural Research Institute	*Bull. Taiwan agric. Res. Inst.*
Fukien Agricultural Journal*	*Fukien agric. J.*
Report	
Report of the Taiwan Sugar Experiment Station	*Rep. Taiwan Sug. Exp. Sta.*
CYPRUS	
Countryman. Nicosia	*Countryman, Nicosia*
Reports	
Report of the Agricultural Officer. Cyprus. (Chemistry)	*Rep. Agric. Officer, Cyprus (Chem.)*
Report of the Agricultural Officer. Cyprus. (Research)	*Rep. Agric. Officer, Cyprus (Res.)*
Report of the Director of Agriculture. Cyprus	*Rep. Dir. Agric. Cyprus*
CZECHOSLOVAKIA	
Annals of the Czechoslovak Academy of Agricultural Sciences	*Ann. czl. Acad. agric. Sci.*
{ Agricultural Economics Series	{ *Agric. Econ. Ser.*
{ Bibliographical Series	{ *Bibl. Ser.*
{ Plant Production Series	{ *Pl. Prod. Ser.*
Polnohospodarstvo	*Polnohospodarstvo*
Za Socialisticke Zemědělstvi	*Za social. Zeměd.*
DENMARK	
Årsskrift Kongelige Veterinaer- og Landbohøjskole	*Årsskr. K. vet. Landbhøjsk.*
Beretning fra den Kongelige Veterinaer- og Landbohøjskoles Laboratorium for Landøkonomiske Forsøg. Kjøbenhavn	*Beretn. Lab. landøkon. Forsøg, Kbh.*
Botaniske Tidsskrift*	*Bot. Tidsskr.*
Comptes Rendus des Travaux du Laboratoire. Carlsberg	*C. R. Lab. Carlsberg*
Dansk Frøavl	*Dansk Frøavl*
Dansk Landbrug	*Dansk Landbr.*
Lin	*Lin*
Naturens Verden. Kjøbenhavn (3)	*Nat. Verd., Kbh.*
Nordisk Jordbruksforskning	*Nord. JordbrForskn.*
Oikos	*Oikos*
Physiologia Plantarum (8)	*Physiol. Plant.*
Proceedings of the International Seed Testing Association	*Proc. internat. Seed Test. Ass.*
Tidsskrift for Planteavl	*Tidsskr. Planteavl*
Ugeskrift for Landmaend	*Ugeskr. Landm.*
EGYPT	
Bulletin of the Scientific and Technical Documentation Centre. Egypt	*Bull. sci. tech. Document. Cent., Egypt*
FALKLAND ISLANDS	
Report of the Department of Agriculture. Falkland Islands	*Rep. Dep. Agric. Falkld Is.*
FIJI	
Agricultural Journal of Fiji	*Agric. J. Fiji*
Report	
Report of the Department of Agriculture. Fiji	*Rep. Dep. Agric. Fiji*
FINLAND	
Annales Botanici Societatis Zoologicae-Botanicae Fennicae. Vanamo	*Ann. bot. Soc. zool.-bot. fenn., Vanamo*
Maataloustieteelinen Aikakauskirja	*Maataloust. Aikakausk.*
Memoranda Societatis pro Fauna et Flora Fennica	*Mem. Soc. Fauna Flor. fenn.*
Suomen Maataloustieteellisen Seuran Julkaisuja	*Suom. Maataloust. Seur. Julk.*
Tammisto Hankkijan Kasvin-jalostuslaitos Siemenjulkaisu	*Tamm. Hankk. Kasvinj. Siemenjulk.*

TITLE	ABBREVIATION USED
FINLAND—(*Continued*)	
Tidskrift för Lantmän	*Tidskr. Lantm.*
Valtion Maatalouskoetoiminnan Julkaisuja	*Valt. Maatalousk. Julk.*
Valtion Maatalouskoetoiminnan Tiedonantoja	*Valt. Maatalousk. Tiedon.*
FRANCE	
Agronomie Tropicale. Nogent-sur-Marne	*Agron. trop., Nogent*
Annales de l'École Nationale d'Agriculture de Rennes	*Ann. Éc. Agric. Rennes*
Annales de l'Institut National de la Recherche Agronomique. Paris	*Ann. Inst. nat. Rech. agron., Paris*
Series A. Annales Agronomiques	*Ser. A. Ann. agron.*
Series B. Annales de l'Amélioration des Plantes	*Ser. B. Ann. Amélior. Pl.*
Bulletin Agronomique du Ministère de la France d'Outre-mer	*Bull. agron. Fr. d'out. mer*
Bulletin of the Botanical Society. France*	*Bull. Bot. Soc. Fr.*
Bulletin de Documentation	*Bull. Document.*
Bulletin de la Fédération Française d'Économie Alpestre	*Bull. Féd. fr. Écon. alp.*
Bulletin Technique d'Information (3)	*Bull. tech. Inform.*
Comptes Rendus Hebdomadaires des Séances de l'Académie d'Agriculture de France	*C. R. Acad. Agric. Fr.*
Coton et Fibres Tropicales	*Cot. et Fibr. trop.*
Journal d'Agriculture Tropicale et de Botanique Appliquée	*J. Agric. trop. et Bot. appl.*
Mémoires de la Société Botanique de France*	*Mém. Soc. bot. Fr.*
Monthly Bibliographical Bulletin	*Mon. bibl. Bull.*
Oléagineux (2)	*Oléagineux*
Pomme de terre Française	*Pomme de terre fr.*
Potasse	*Potasse*
Receuil des Travaux des Laboratoires de Botanique, Géologie et Zoologie*	*Rec. Trav. Lab. Bot., Géol., Zool.*
Revue Internationale des Industries Agricoles	*Rev. internat. Industr. agric.*
Riz et Riziculture	*Riz et Riziculture*
Reports	
Rapport de l'Institut National de la Recherche Agronomique	*Rapp. Inst. Rech. agron.*
Rapport de la Société d'Encouragement de la Culture des Orges de Brasserie et des Houblons en France	*Rapp. SECOBRAH*
GERMANY	
Angewandte Botanik (2)	*Angew. Bot.*
Beiträge zur Biologie der Pflanzen	*Beitr. Biol. Pfl.*
Berichte der Deutschen Botanischen Gesellschaft *	*Ber. dtsch. bot. Ges.*
Biologisches Zentralblatt (2)	*Biol. Zbl.*
Botanische Jahrbücher. Stuttgart	*Bot. Jahrb., Stuttgart*
Deutsche Landwirtschaft (3)	*Dtsch. Landw.*
Deutsche Landwirtschaftliche Presse	*Dtsch. landw. Pr.*
Flora. Jena	*Flora, Jena*
Kartoffelbau (3)	*Kartoffelbau*
Kühn-Archiv	*KühnArchiv*
Landwirtschaftliche Forschung (3)	*Landw. Forsch.*
Landwirtschaftliche Jahrbuch. Bayern	*Landw. Jahrb., Bayern*
Nachrichtenblatt des Deutschen Pflanzenschutzdienstes. Stuttgart (5)	*NachrBl. dtsch. PflSchDienst., Stuttgart*
Saatgutwirtschaft (3)	*Saatgutwirtschaft*
Zeitschrift für Acker- und Pflanzenbau	*Z. Acker- u. Pflbau*
Zeitschrift für Pflanzenbau und Pflanzenschutz	*Z. Pflbau*
Zeitschrift für Pflanzener ährung, Düngung, Bodenkunde	*Z. PflErnähr. Düng.*
Zeitschrift für Pflanzenkrankheit (Pflanzenpathologie) und Pflanzenschutz (2)	*Z. PflKrankh.*
Züchter (2)	*Züchter*

TITLE	ABBREVIATION USED
GREAT BRITAIN	
Abstracts on Agricultural and Horticultural Engineering	*Abstr. agric. hort. Engng*
Abstracts and News Summary of the Fungicide and Insecticidal Research Co-ordinating Services. Section C	*Abstr. Fung. Insect. Res. Co-ord. Serv. Sect. C*
Advancement of Science	*Advanc. Sci.*
Agricultural Merchant	*Agric. Merch.*
Agricultural Progress	*Agric. Progr.*
Agricultural Review. London (8)	*Agric. Rev., Lond.*
Agriculture. London	*Agriculture, Lond.*
Analyst. London (8)	*Analyst, Lond.*
Analytical Abstracts	*Anal. Abstr.*
Anglo-Swedish Review	*Anglo-Swed. Rev.*
Animal Breeding Abstracts	*Anim. Breed. Abstr.*
Annals of Applied Biology (8)	*Ann. appl. Biol.*
Annals of Botany. London (8)	*Ann. Bot., Lond.*
Applied Statistics (8)	*Appl. Statist.*
Berkshire Notes and News (8)	*Berks Notes and News*
Biochemical Journal (8)	*Biochem. J.*
Biological Reviews (8)	*Biol. Rev.*
Biometrika (8)	*Biometrika*
British Journal of Animal Behaviour (8)	*Brit. J. Anim. Behav.*
British Journal of Applied Physics (8)	*Brit. J. appl. Phys.*
British Journal of Nutrition (8)	*Brit. J. Nutr.*
British Journal of Photography (8)	*Brit. J. Photogr.*
British Sugar Beet Review	*Brit. Sug. Beet Rev.*
Bulletin of Entomological Research	*Bull. ent. Res.*
Chemistry and Industry (8)	*Chem. and Industr.*
Colonial Development	*Colon. Devel.*
Colonial Plant and Animal Products	*Colon. Pl. Anim. Prod.*
Countryman. Burford (8)	*Countryman, Burford*
Dairy Farmer	*Dairy Fmr*
Dairy Science Abstracts	*Dairy Sci. Abstr.*
Discovery (8)	*Discovery*
Empire Cotton Growing Review	*Emp. Cott. Gr. Rev.*
Empire Journal of Experimental Agriculture	*Emp. J. exp. Agric.*
Endeavour	*Endeavour*
Essex Farmers' Journal	*Essex Fmrs' J.*
Esso Farmer (8)	*Esso Fmr*
Farm, Dagenham	*Farm, Dagenham*
Farm Economist	*Fm Econ.*
Farm Implement and Machinery Review (8)	*Fm Impl. Rev.*
Farm Mechanization	*Fm Mechaniz.*
Farm Review	*Fm Rev.*
Farmer and Stock-Breeder	*Fmr and Stk-Breed.*
Farmer's Weekly, London	*Fmr's Wkly, Lond.*
Farming Reporter (Ferguson) (8)	*Fmg Reptr*
Forestry Abstracts	*For. Abstr.*
Geographical Journal (7)	*Geogr. J.*
Helminthological Abstracts	*Helminth. Abstr.*
Heredity *	*Heredity*
Herefordshire Agricultural Journal (8)	*Hereford. agric. J.*
Horticultural Abstracts	*Hort. Abstr.*
Journal of Agricultural Economics	*J. agric. Econ.*
Journal of Agricultural Science (8)	*J. agric. Sci.*
Journal of the Agricultural Society, University College of Wales.	*J. agric. Soc. Univ. Coll. Wales*
Journal of Animal Ecology (8)	*J. Anim. Ecol.*
Journal of the British Grassland Society	*J. Brit. Grassld Soc.*
Journal of Comparative Pathology and Therapeutics (8)	*J. comp. Path.*
Journal of Documentation (8)	*J. Document.*

TITLE	ABBREVIATION USED
GREAT BRITAIN—(*Continued*)	
Journal of Ecology (8)	*J. Ecol.*
Journal of Experimental Botany	*J. exp. Bot.*
Journal of the Farmers' Club. London	*J. Fmrs' Cl., Lond.*
Journal of General Microbiology (8)	*J. gen. Microbiol.*
Journal of Genetics *	*J. Genet.*
Journal of Helminthology (8)	*J. Helminth.*
Journal of Horticultural Science (8)	*J. hort. Sci.*
Journal of the Institute of Brewing (11)	*J. Inst. Brew.*
Journal of the Institute of Corn and Agricultural Merchants, Ltd.	*J. Inst. Corn agric. Merch.*
Journal of the Land Agents' Society	*J. Land Agents' Soc.*
Journal of the Linnean Society (Botany)	*J. Linn. Soc. (Bot.)*
Journal of the National Institute of Agricultural Botany	*J. nat. Inst. agric. Bot.*
Journal of the Royal Agricultural Society	*J. roy. agric. Soc.*
Journal of the Royal Horticultural Society (8)	*J. roy. hort. Soc.*
Journal of the Royal Society of Arts (8)	*J. roy. Soc. Arts*
Journal of the Royal Statistical Society. Series B (8)	*J. R. statist. Soc. Ser. B*
Journal of the Science of Food and Agriculture (8)	*J. Sci. Fd Agric.*
Journal of Scientific Instruments (8)	*J. sci. Instrum.*
Journal of Soil Science	*J. Soil Sci.*
Journal of the Sports Turf Research Institute (8)	*J. Sports Turf Res. Inst.*
Kew Bulletin (8)	*Kew Bull.*
Laboratory Practice (8)	*Lab. Prac.*
Manx Journal of Agriculture	*Manx J. Agric.*
Memoirs of the Department of Agriculture. University of Cambridge	*Mem. Dep. Agric. Camb.*
Memoirs of the Soil Survey of Great Britain	*Mem. Soil Surv. Gt. Brit.*
Meteorological Magazine. London (8)	*Met. Mag., Lond.*
Milk Producer (8)	*Milk Prod.*
Monthly Digest of Statistics (8)	*Mon. Dig. Statist.*
Monthly Information Sheet. British Standards Institution (8)	*Mon. Inform. Sh. Brit. Stand. Inst.*
Monthly Report of the Ministry of Agriculture. Northern Ireland	*Mon. Rep. Minist. Agric. N. Ire.*
Monthly Weather Report of the Meteorological Office. London (8)	*Mon. Weath. Rep., Lond.*
National Farmers' Union Information Service (8)	*N.F.U. Inform. Serv.*
Nature. London (8)	*Nature, Lond.*
New Commonwealth	*New Commonw.*
New Phytologist (8)	*New Phytol.*
Notes and News. Berkshire Agricultural Executive Committee (8)	*Notes and News, Berks agric. Exec. Cttee*
Notes from the Royal Botanic Gardens. Edinburgh (2)	*Notes roy. bot. Gdn, Edinb.*
Nutrition Abstracts and Reviews	*Nutr. Abstr. Rev.*
Parks, Golf Courses and Sports Grounds	*Parks*
Pig Breeders' Gazette (8)	*Pig Breed. Gaz.*
Pig Farming (8)	*Pig Fmg*
Plant Breeding Abstracts	*Pl. Breed. Abstr.*
Plant Pathology	*Pl. Path.*
Plant Protection Overseas Review	*Pl. Prot. Overseas Rev.*
Poultry. London (8)	*Poultry, Lond.*
Power Farmer. London	*Pwr Fmr, Lond.*
Proceedings of the Botanical Society of the British Isles (8)	*Proc. Bot. Soc. Brit. Is.*
Proceedings of the British Society of Animal Production	*Proc. Brit. Soc. Anim. Prod.*
Proceedings of the Nutrition Society (8)	*Proc. Nutr. Soc.*
Proceedings of the Royal Society of Edinburgh. Section B (8)	*Proc. roy. Soc. Edinb. Sect. B*
Progress. London	*Progress, Lond.*
Quarterly Review. National Agricultural Advisory Service	*Quart. Rev. N.A.A.S.*
Quarterly Review of the Royal Agricultural Society of England	*Quart. Rev. roy. agric. Soc. Engl.*
Research. London (2)	*Research, Lond.*
Review of Applied Entomology	*Rev. appl. Ent.*
Review of Applied Mycology	*Rev. appl. Mycol.*
Scottish Agriculture	*Scot. Agric.*
Search	*Search*

GREAT BRITAIN —(*Continued*)

Seed Trade Review	*Seed Tr. Rev.*
Soils and Fertilizers	*Soils and Ferts*
Suffolk Farmers' Journal	*Suffolk Fmrs' J.*
Times Review of Agriculture (8)	*Times Rev. Agric.*
Times Review of British Colonies (8)	*Times Rev. Brit. Colon.*
Times Review of Science (8)	*Times Rev. Sci.*
Transactions of the British Mycological Society (8)	*Trans. Brit. mycol. Soc.*
Transactions and Proceedings of the Botanical Society of Edinburgh*	*Trans. bot. Soc. Edinb.*
Transactions of the Royal Highland and Agricultural Society of Scotland	*Trans. roy. Highl. agric. Soc. Scot.*
Veterinary Bulletin. Weybridge (8)	*Vet. Bull., Weybridge*
Veterinary Record (8)	*Vet. Rec.*
Veterinary Reviews and Annotations (8)	*Vet. Rev. Annot.*
Warwickshire Farmer (8)	*Warw. Fmr*
Warwickshire Farmers' Guide (8)	*Warw. Fmrs' Guide*
Watsonia (8)	*Watsonia*
Weather	*Weather*
Worcestershire Agricultural Chronicle (8)	*Worcs. agric. Chron.*
World Crops	*World Crops*

Reports

Progress Report from Experiment Stations. Empire Cotton Growing Corporation	*Progr. Rep. Exp. Stas. Emp. Cott. Gr. Corp.*
Report of the Agricultural and Horticultural Research Station. University of Bristol. Long Ashton	*Rep. agric. hort. Res. Sta. Long Ashton*
Report of the Agricultural Research Institute of Northern Ireland	*Rep. agric. Res. Inst. N. Ire.*
Report of the Aynsome Laboratory	*Rep. Aynsome Lab.*
Report of the Board of Agriculture. Isle of Man	*Rep. Bd Agric. I.o.M.*
Report of the British Council	*Rep. Brit. Coun.*
Report of the British Sulphate of Ammonia Federation, Limited	*Rep. Brit. Sulph. Ammon. Fed.*
Report of the Colonial Development Corporation	*Rep. Colon. Devel. Corp.*
Report of the Commonwealth Agricultural Bureaux Executive Council. Farnham Royal	*Rep. Commonw. agric. Bur., Farnham Royal*
Report of the Directorate of Colonial Surveys	*Rep. Dir. colon. Surv.*
Report of the East Malling Research Station	*Rep. E. Malling Res. Sta.*
Report of the Edinburgh and East of Scotland College of Agriculture	*Rep. Edinb. Coll. Agric.*
Report of the Experimental and Research Station. Cheshunt	*Rep. exp. Res. Sta., Cheshunt*
Report of the Food Investigation Board	*Rep. Fd Invest. Bd*
Report of the Glasgow and West of Scotland Agricultural College	*Rep. W. Scot. agric. Coll.*
Report of the Hannah Dairy Research Institute	*Rep. Hannah Dairy Inst.*
Report of the Home Grown Threshed Peas Joint Committee	*Rep. Home Gr. Threshed Peas Joint Cttee*
Report of the Imperial Forestry Institute. Oxford	*Rep. imp. for. Inst. Oxf.*
Report of the John Innes Horticultural Institution	*Rep. Innes hort. Inst.*
Report of the Lincolnshire Seed Growers' Association	*Rep. Lincoln. Seed Gr. Ass.*
Report of the Macaulay Institute for Soil Research	*Rep. Macaulay Inst. Soil Res.*
Report of the National Institute of Agricultural Botany. Cambridge	*Rep. nat. Inst. agric. Bot., Camb.*
Report of the National Institute for Research in Dairying. Reading University	*Rep. nat. Inst. Dairy., Reading*
Report of the National Vegetable Research Station. Wellesbourne, Warwick	*Rep. nat. veg. Res. Sta., Warwick*
Report of the Norfolk Agricultural Station	*Rep. Norfolk agric. Sta.*
Report of the Principal to the Governing Body. Wye College	*Rep. Govern. Body, Wye Coll.*
Report of the Rothamsted Experiment Station	*Rep. Rothamst. exp. Sta.*
Report of the Scottish Society for Research in Plant Breeding	*Rep. Scot. Soc. Res. Pl. Breed.*

TITLE	ABBREVIATION USED
GREECE	
Report of the Hellenic Agricultural Research Station	*Rep. Hellenic agric. Res. Sta.*
HAWAII	
Hawaiian Planters' Record (5)	*Hawaii. Planters' Rec.*
Pacific Science. Hawaii (4)	*Pacif. Sci., Hawaii*
Report	
Report of the Agricultural Experiment Station. Hawaii	*Rep. agric. Exp. Sta., Hawaii*
HONG KONG	
Report of the Department of Agriculture, Fisheries and Forestry. Hong Kong	*Rep. Dep. Agric., Fish., For. Hong Kong*
HUNGARY	
Acta Agronomica Hungarica	*Acta agron. hung.*
Acta Biologica Hungarica	*Acta biol. hung.*
Agrokémia. Budapest	*Agrokémia, Budapest*
Agrokémia és Talajtan	*Agrokémia és Talaj.*
Hungarian Agricultural Review	*Hung. agric. Rev.*
Növénytermelés	*Növénytermelés*
ICELAND	
Botany of Iceland*	*Bot. Iceld*
INDIA	
Agriculture and Animal Husbandry in Uttar Pradesh	*Agric. Anim. Husb., Uttar Pradesh*
Allahabad Farmer	*Allahabad Fmr*
Bibliography of Scientific Publications of South Asia	*Bibl. sci. Publ. S. Asia*
Bulletin of the Botanical Society of Bengal*	*Bull. bot. Soc. Beng.*
Central Board of Irrigation Abstracts	*Cent. Bd Irrig. Abstr.*
Current Science	*Curr. Sci.*
Farmer. Bombay	*Farmer, Bombay*
Indian Cotton Growing Review	*Indian Cott. Gr. Rev.*
Indian Farming	*Indian Fmg*
Indian Journal of Agricultural Science	*Indian J. agric. Sci.*
Indian Journal of Genetics and Plant Breeding	*Indian J. Genet.*
Indian Journal of Veterinary Science and Animal Husbandry	*Indian J. vet. Sci.*
Indian Phytopathology*	*Indian Phytopath.*
Indian Veterinary Journal (9)	*Indian vet. J.*
Journal of the Indian Botanical Society*	*J. Indian bot. Soc.*
Journal of Research. Agra University 10)	*J. Res., Agra*
Journal of Scientific Research. Banaras Hindu University	*J. sci. Res., Banaras*
Journal of Soil and Water Conservation in India	*J. Soil Wat. Conserv., India*
Journal of the University of Bombay. Section B (3)	*J. Univ. Bombay. Sect. B*
Jute Bulletin	*Jute Bull.*
Madras Agricultural Journal	*Madras agric. J.*
Mysore Agricultural Journal	*Mysore agric. J.*
Phytomorphology (8)	*Phytomorphology*
Plant Protection Bulletin	*Pl. Prot. Bull.*
Poona Agricultural College Magazine (3)	*Poona agric. Coll. Mag.*
Proceedings of the Bihar Academy of Agricultural Science*	*Proc. Bihar Acad. agric. Sci.*
Proceedings of the Indian Academy of Science (3)	*Proc. Indian Acad. Sci.*
Proceedings of the Indian Science Congress	*Proc. Indian sci. Congr.*
Proceedings of the National Academy of Sciences. India	*Proc. nat. Acad. Sci., India*
Proceedings of the National Institute of Sciences. India	*Proc. nat. Inst. Sci., India*
Rice News Teller	*Rice News Tell.*
Science and Culture	*Sci. and Cult.*

TITLE	ABBREVIATION USED
INDIA—(*Continued*)	
Reports	
Report of the Central Rice Research Institute. Cuttack	*Rep. Rice Res. Inst., Cuttack*
Report of the Department of Agriculture. Bombay	*Rep. Dep. Agric., Bombay*
Report of the Indian Central Cotton Committee	*Rep. Indian Cott. Cttee*
Report of the Indian Council of Agricultural Research. New Delhi	*Rep. Indian Coun. agric. Res., New Delhi*
Report of the Institute of Plant Industry. Indore	*Rep. Inst. Pl. Industr., Indore*
Report of the Subordinate Officers of the Department of Agriculture. Madras	*Rep. subord. Offrs Dep. Agric. Madras*
Scientific Reports of the (Indian) Agricultural Research Institute. New Delhi	*Sci. Rep. agric. Res. Inst. N. Delhi*
INDONESIA	
Chronica Naturae (2)	*Chron. nat.*
Indonesian Journal for Natural Science	*Indones. J. nat. Sci.*
Landbouw (2)	*Landbouw*
INTERNATIONAL	
Bulletin du Comité National Belge de la F.A.O.	*Bull. Cté nat. belge F.A.O.*
Development Papers (F.A.O.)	*Devel. Pap. F.A.O.*
Impact of Science on Society (UNESCO)	*Impact Sci. Soc.*
International Agro-Climatological Studies*	*Internat. agroclimatol. Stud.*
International Rice Commission News Letter (F.A.O.)	*Internat. Rice Comm. News Lett.*
Monthly Letter of the Director General (F.A.O.)	*Mon. Lett. F.A.O.*
Plant Protection Bulletin	*Pl. Prot. Bull.*
IRELAND, REPUBLIC OF	
Agricultural Ireland	*Agric. Ire.*
Economic Proceedings of the Royal Dublin Society	*Econ. Proc. roy. Dublin Soc.*
Journal of the Department of Agriculture. Republic of Ireland	*J. Dep. Agric. Republ. Ire.*
Scientific Proceedings of the Royal Dublin Society	*Sci. Proc. roy. Dublin Soc.*
Report	
Report of the Minister for Agriculture. Republic of Ireland	*Rep. Minist. Agric. Republ. Ire.*
ISRAEL	
Bulletin of the Research Council. Israel	*Bull. Res. Coun. Israel*
Ktavim. Records of the Agricultural Research Station. Israel	*Ktavim, Israel*
Palestine Journal of Botany. Jerusalem Series	*Palest. J. Bot. J. Ser.*
Palestine Journal of Botany. Rehovot Series (2)	*Palest. J. Bot. R. Ser.*
ITALY	
Agricoltura delle Venezie (3)	*Agricoltura d. Venezie*
Annali di Botanica. Roma (6)	*Ann. Bot., Roma*
Annali della Facoltà di Agraria. Università di Bari	*Ann. Fac. Agr., Bari*
Annali della Facoltà di Agraria. Università di Milano	*Ann. Fac. Agr., Milano*
Annali della Facoltà di Agraria. Università di Napoli	*Ann. Fac. Agr., Napoli*
Annali della Facoltà di Agraria. Università di Perugia (3)	*Ann. Fac. Agr., Perugia*
Annal. della Sperimentazione Agraria	*Ann. Sper. agr.*
Annali della Stazione Chimico-Agraria Sperimentale di Roma	*Ann. Sta. chim.-agr., Roma*
Atti dell' Istituto Botanico della Università di Pavia	*Atti Ist. bot., Pavia*
Genetica Agraria (3)	*Genet. agr.*
Giornale di Agricoltura della Domenica	*G. Agric. Domen.*
Humus	*Humus*
Industria Saccarifera Italiana	*Industr. saccar. ital.*
Italia Agricola	*Ital. agric.*
Nuovo Giornale Botanico Italiano	*Nuovo G. bot. ital.*

TITLE	ABBREVIATION USED
ITALY—(*Continued*)	
Ricerca Scientifica	*Ric. sci.*
Riso	*Riso*
Rivista di Agricoltura Subtropicale e Tropicale (2)	*Riv. Agric. subtrop.*
Rivista di Ecologia	*Riv. Ecol.*
Rivista di Zootecnia. Milano (1)	*Riv. Zootec., Milano*
Reports	
Rapporto della Stazione Sperimentale di Granicoltura di Catania	*Rapp. Sta. sper., Granicolt., Catania*
Rapporto della Stazione Sperimentale Agraria di Bari	*Rapp. Sta. sper. agr., Bari*
Rapporto della Stazione Sperimentale di Bieticoltura di Rovigo	*Rapp. Sta. sper. Bieticolt., Rovigo*
Rapporto della Stazione Sperimentale di Maiscoltura di Bergamo	*Rapp. Sta. sper. Maiscolt., Bergamo*
Rapporto della Stazione Sperimentale di Praticoltura di Lodi	*Rapp. Sta. sper. Praticolt., Lodi*
JAPAN	
Annals of the Phytopathological Society of Japan (5)	*Ann. phytopath. Soc. Japan*
Bericht des Ohara Instituts für Landwirtschaftliche Biologie	*Ber. Ohara Inst.*
Botanical Magazine. Tokyo (5)	*Bot. Mag., Tokyo*
Bulletin of the Faculty of Agriculture. Kagoshima University	*Bull. Fac. Agric., Kagoshima*
Bulletin of the Faculty of Agriculture. Shinshu University (3)	*Bull. Fac. Agric., Shinshu*
Bulletin of the Institute of Agricultural Research. Tôhoku (3)	*Bull. Inst. agric. Res., Tôhoku*
Bulletin of the National Institute of Agricultural Sciences. Nishigahara	*Bull. nat. Inst. agric. Sci., Nishigahara*
Bulletin of the Yamgata Agricultural College (3)	*Bull. Yamgata agric. Coll.*
Cytologia	*Cytologia*
Ecological Review. Tôhoku*	*Ecol. Rev., Tôhoku*
Japanese Journal of Botany*	*Japan. J. Bot.*
Journal of the Faculty of Agriculture. Kyushu University	*J. Fac. Agric., Kyushu*
Journal of the Faculty of Science, Hokkaido University. Series Botany (5)	*J. Fac. Sci., Hokkaido. Ser. Bot.*
Journal of the Horticultural Association of Japan (2)	*J. hort. Ass. Japan*
Journal of the Science of Soil and Manure. Tokyo	*J. Sci. Soil, Tokyo*
Memoirs of the Hyogo Prefectural University of Agriculture (8)	*Mem. Hyogo Prefect. Univ. Agric.*
Proceedings of the Crop Science Society of Japan	*Proc. Crop Sci. Soc. Japan*
Proceedings of the Imperial Academy of Japan (8)	*Proc. imp. Acad. Japan*
Record of Research, Faculty of Agriculture. Tokyo University (7)	*Rec. Res. Fac. Agric., Tokyo*
Research Bulletin of the Hokkaido National Experiment Station	*Res. Bull. Hokkaido nat. agric. Exp. Sta.*
Science Bulletin of the Faculty of Agriculture. Kyushu University	*Sci. Bull. Fac. Agric., Kyushu*
Technical Bulletin of the Kagawa-Ken Agricultural College	*Tech. Bull. Kagawa-Ken agric. Coll.*
Tôhoku Journal of Agricultural Research*	*Tôhoku J. agric. Res.*
Reports	
Report of the Institute of Agricultural Research. Tôhoku University	*Rep. Inst. agric. Res. Tôhoku*
Report of the National Institute of Genetics	*Rep. nat. Inst. Genet.*
MADAGASCAR	
Rapport de l' Inspection Générale du Service Agricole et de la Recherche Agronomique. Madagascar	*Rapp. Inspect. gén. Serv. Agric. Rech. Agron. Madagascar*
MALAYA, FEDERATION OF	
Malayan Agricultural Journal	*Malay. agric. J.*
Malayan Journal of Tropical Geography*	*Malay. J. trop. Geogr.*
Report	
Report of the Department of Agriculture. Malaya	*Rep. Dep. Agric. Malaya*

TITLE	ABBREVIATION USED
MALTA	
Report of the Department of Agriculture. Malta	*Rep. Dep. Agric. Malta*
MAURITIUS	
Revue Agricole de l'Ile Maurice (2)	*Rev. agric. Maurice*
Reports	
Report of the Department of Agriculture. Mauritius	*Rep. Dep. Agric. Mauritius*
Report of the Sugar Industry Research Station. Mauritius	*Rep. Sug. Industr. Res. Sta., Mauritius*
NETHERLANDS	
Acta Botanica Néerlandica*	*Acta bot. néerl.*
Behaviour (8)	*Behaviour*
Blumea*	*Blumea*
Conserva (12)	*Conserva*
Euphytica	*Euphytica*
Jaarboekje van het Nationaal Comité voor Brouwgerst	*Jaarb. NaCoBrouw.*
Jaarboekje van de Stichting voor Coördinatie van Cultuur en Onderzoek van Broodgraan	*Jaarb. CoCoBro.*
Landbouwkundig Tijdschrift. Wageningen	*Landbouwk. Tijdschr., Wageningen*
Landbouwvoorlichting	*LandbVoorl.*
Materiae Vegetabiles (2)	*Materiae veg.*
Mededeelingen van het Instituut voor Rationeele Suikerproductie	*Meded. Inst. rat. Suikerprod.*
Mededeelingen van de Landbouwhogeschool. Wageningen	*Meded. LandbHogesch., Wageningen*
Mededeelingen van de Landbouwvoorlichtingsdienst. Wageningen	*Meded. LandbVoorlDienst, Wageningen*
Nederlandsch Kruidkundig Archief	*Ned. kruidk. Arch.*
Netherlands Journal of Agricultural Science	*Neth. J. agric. Sci.*
Plant and Soil	*Plant and Soil*
Planta	*Planta*
Recueil des Travaux Botaniques Néerlandais	*Rec. Trav. bot. néerl.*
Regnum Vegetabile. Utrecht*	*Reg. veg., Utrecht*
Stikstof	*Stikstof*
TNO Niews	*TNO Niews*
Tropical Abstracts	*Trop. Abstr.*
Vegetatio, Acta Geobotanica. Haag	*Vegetatio, Haag*
Reports	
Jaarverslag. Landbouw-Economisch Instituut	*Jaarversl. Landb.-Econ. Inst.*
Jaarverslag Nederlandsche Algemene Keuringsdienst	*Jaarversl. ned. Keuringsd.*
Rapporte van de Commissie ter Bevorderung der Suikerbietenteelt	*Rapp. Comm. Bevord. Suikerbiet.*
Verslag. Centraal Instituut voor Landbouwkundig Onderzoek, Wageningen	*Versl. Cent. Inst. Landb. Onderz., Wageningen*
Verslag. Instituut voor Plantenveredeling	*Versl. Inst. PlVered.*
Verslag Rijkslandbouwproefstation. Groningen	*Versl. Rijkslandb. Proefsta., Groningen*
NEW CALEDONIA	
Quarterly Bulletin of the South Pacific Commission	*Quart. Bull. S. Pacif. Comm.*
Revue Agricole de la Nouvelle-Calédonie	*Rev. agric. Nouv.-Calédonie*
NEW ZEALAND	
Dairy-Farming Annual	*Dairy-fmg Annu.*
New Zealand Geographer	*N.Z. Geogr*
New Zealand Geographical Society Record	*N.Z. geogr. Soc. Rec.*
New Zealand Journal of Agriculture	*N.Z. J. Agric.*
New Zealand Journal of Science and Technology. Series A	*N.Z. J. Sci. Technol. A*
New Zealand Journal of Science and Technology. Series B	*N.Z. J. Sci. Technol. B*
New Zealand Official Yearbook	*N.Z. off. Yearb.*
Proceedings of the New Zealand Society of Animal Production	*Proc. N.Z. Soc. Anim. Prod.*
Proceedings of the Ruakura Farmers' Conference	*Proc. Ruakura Fmrs' Conf.*
Sheep-Farming Annual	*Sheep-fmg Annu.*

NEW ZEALAND—(*Continued*)

Reports

Report of the Canterbury Agricultural College	*Rep. Canterbury (N. Z.) agric. Coll.*
Report of the Cawthron Institute for Scientific Research	*Rep. Cawthron Inst.*
Report of the Department of Agriculture. New Zealand	*Rep. Dep. Agric. N.Z.*
Report of the Department of Scientific and Industrial Research. New Zealand	*Rep. Dep. Sci. industr. Res. N.Z.*

NORWAY

Årbok for Beitebruk i Norge	*Årb. Beitebr. Norge*
Forskning og Forsøk i Landbruket	*Forskn. Fors. Landbr.*
Meddelelser fra det Norske Myrselskap	*Medd. norske Myrselsk.*
Meldinger fra Norges Landbrukshøiskole	*Meld. Norg. LandbrHøisk.*
Melding fra Statens Frökontroll i Ås	*Meld. Stat. Frökontroll Ås*
Norske Fjellbeite	*Norske Fjellb.*
Norsk Landbruk	*Norsk Landbr.*
Tidsskrift for det Norske Landbruk	*Tidsskr. norske Landbr.*

PAKISTAN

Co-operation and Marketing Review	*Co-oper. Mktg Rev.*
Pakistan Cotton Bulletin (3)	*Pakist. Cott. Bull.*
Pakistan Journal of Science	*Pakist. J. Sci.*
Pakistan Review of Agriculture	*Pakist. Rev. Agric.*
Proceedings of the Pakistan Scientific Conference	*Proc. Pakist. sci. Conf.*

PAPUA AND NEW GUINEA

Agricultural Gazette of Papua and New Guinea	*Agric. Gaz. Papua*

PHILIPPINE REPUBLIC

Philippine Agriculturist (2)	*Philipp. Agriculturist*
Philippine Journal of Agriculture (2)	*Philipp. J. Agric.*
Philippine Journal of Science (5)	*Philipp. J. Sci.*

POLAND

Acta Microbiologica Polonica	*Acta. microbiol. Polon.*
Acta Societatis Botanicorum Poloniae	*Acta Soc. Bot. Polon.*
Annales Universitatis Mariae Curie-Sklodowska	*Ann. Univ. M. Curie-Sklodowska*
Bulletin de l'Académie Polonaise des Sciences	*Bull. Acad. polon. Sci.*
Ochrana Rostlin (2)	*Ochr. Rost.*
Polish Technical Abstracts (4)	*Pol. tech. Abstr.*
Polskie Archiwum Weterynaryjne	*Polsk. Arch. Weter.*
Quarterly Review. Polish Academy of Science.	*Quart. Rev. Polish Acad. Sci.*

PORTUGAL

Agronomia Lusitana	*Agron. lusit.*
Agros. Lisboa	*Agros, Lisboa*
Anais do Instituto Superior de Agronomia. Lisboa (3)	*An. Inst. sup. Agron., Lisboa*
Boletim da Sociedade Broteriana	*Bol. Soc. broteriana*
Garcia de Orta. Lisboa	*Garcia de Orta, Lisboa*
Melhoramento (8)	*Melhoramento*
Memórias da Sociedade Broteriana	*Mem. Soc. broteriana*
Portugaliae Acta Biologica. Series A	*Portug. Acta biol. Ser. A*
Portugaliae Acta Biologica. Series B	*Portug. Acta biol. Ser. B*
Revista Agronômica. Lisboa	*Rev. agron., Lisboa*

REUNION

Revue Agricole de l'Ile de Réunion (3)	*Rev. agric. Réunion*

TITLE	ABBREVIATION USED
SARAWAK	
Sarawak Museum Journal	*Sarawak Mus. J.*
Report	
Report of the Department of Agriculture. Sarawak	*Rep. Dep. Agric. Sarawak*
SEYCHELLES	
Report of the Department of Agriculture. Seychelles	*Rep. Dep. Agric. Seychelles*
SOUTH AND CENTRAL AMERICA	
ARGENTINA	
Anales de la Sociedad Científica. Argentina	*An. Soc. Cient., Argent.*
Anales de la Sociedad Rural. Argentina*	*An. Soc. rur., Argent.*
Boletín Bibliografico. Argentina	*Bol. bibl., Argent.*
Boletín Informativo, Dirección Nacional de Granos y Elevadores	*Bol. inform. Direcc. nac. Gran. Elev.*
Boletín de Producción y Fomento Agricola. Argentina	*Bol. Prod. Fom. agric., Argent.*
Ciencia y Investigación	*Cienc. y Invest.*
Darwiniana. Buenos Aires	*Darwiniana, B. Aires*
Idia	*Idia*
Lilloa	*Lilloa*
Meteoros. Buenos Aires	*Meteoros, B. Aires*
Phyton	*Phyton*
Publicaciones Instituto de Sanidad Vegetal. Buenos Aires	*Publ. Inst. Sanid. veg., B. Aires*
Revista Argentina de Agronomía	*Rev. argent. Agron.*
Revista de la Facultad de Agronomía. Eva Perón	*Rev. Fac. Agron., Eva Perón*
Revista de la Facultad de Agronomía y Veterinaria. Buenos Aires	*Rev. Fac. Agron., B. Aires*
Revista de la Facultad de Ciencias Agrarias. Mendoza	*Rev. Fac. Cienc. agr., Mendoza*
Revista Industrial y Agrícola de Tucumán	*Rev. industr. agríc. Tucumán*
Revista de Investigaciones Agrícolas. Buenos Aires	*Rev. Invest. agríc., B. Aires*
BOLIVIA	
Revista de Agricultura. Cochabamba (3)	*Rev. Agric., Cochabamba*
BRAZIL	
Agronomia. Rio de Janeiro	*Agronomia, Rio de J.*
Agronômico. Campinas	*Agronômico, Campinas*
Agros. Pelotas	*Agros, Pelotas*
Anais Botânicos do Herbário Barbosa Rodrigues. Santa Catarina	*An. bot. Herb. Santa Catarina*
Anais da Escola Superior de Agricultura. Luis de Queiroz	*An. Esc. Agric., Queiroz*
Archivos da Escola Superior de Veterinária do Estado de Minas Gerais	*Arch. Esc. Vet., Minas Gerais*
Archivos do Jardim Botânico. Rio de Janeiro	*Arch. Jard. bot., Rio de J.*
Archivos do Serviço Florestal do Brasil	*Arch. Serv. flor., Brasil*
Biológico. São Paulo (3)	*Biol gico, S. Paulo*
Boletim da Directoria da Producão Animal	*Bol. Dir. Prod. anim.*
Boletim de Industria Animal	*Bol. Industr. anim.*
Boletim do Ministério da Agricultura. Brasil	*Bol. Minist. Agric., Brasil*
Boletim Técnico do Instituto Agronômico do Norte	*Bol. téc. Inst. agrôn., Norte*
Boletim Técnico do Instituto Agronômico do Sul	*Bol. téc. Inst. agrôn., Sul*
Bragantia	*Bragantia*
Fomento Agricola. São Paulo	*Foment. agric., S. Paulo*
Lavoura Arrozeira	*Lavour. arroz.*
Revista de Agricultura. Piracicaba	*Rev. Agric., Piracicaba*
Revista Agronômica. Porto Alegre	*Rev. Agron., Porto Alegre*
Revista dos Criadores	*Rev. Criad.*
Rodriguesia	*Rodriguesia*
BRITISH GUIANA	
Administration Report of the Department of Agriculture. British Guiana	*Admin. Rep. Dep. Agric. Brit. Guiana*

TITLE	ABBREVIATION USED
SOUTH AND CENTRAL AMERICA—(*Continued*)	
Divisional Report of the Department of Agriculture. British Guiana	*Div. Rep. Dep. Agric., Brit. Guiana*
Farm Journal of British Guiana*	*Fm J., Brit., Guiana*
CHILE	
Agricultura Técnica. Santiago de Chile	*Agric. téc., Santiago*
Boletín de Instituto de Investigaciones Veterinarias. Chile	*Bol. Inst. Invest. vet., Chile*
COLOMBIA	
Acta Agronómica. Palmira	*Acta agron., Palmira*
Agricultura Tropical. Bogota	*Agric. trop., Bogota*
Boletin Informativo. Colombia	*Bol. inform., Colombia*
Informacion Técnica	*Inform. téc.*
Notas Agronómicas. Estación Agricola Experimental de Palmira	*Notas agron. Esta. agric., Palmira*
Revista de la Facultad Nacional de Agronomía. Medellín	*Rev. Fac. nac. Agron., Medellín*
COSTA RICA	
Information Bulletin. Costa Rica	*Inform. Bull., Costa Rica*
Revista de Agricultura. Costa Rica	*Rev. Agric., Costa Rica*
Suelo Tico	*Suelo tico*
Turrialba	*Turrialba*
DUTCH GUIANA	
Surinaamse Landbouw	*Surinam. Landb.*
ECUADOR	
Flora. Ecuador*	*Flora, Ecuador*
EL SALVADOR	
Report. Centro Nacional Agronomía. El Salvador	*Rep. Cent. nac. Agron., El Salvador*
GUATEMALA	
Revista Agrícola. Guatemala	*Rev. agric., Guatemala*
MEXICO	
Anales del Instituto de Biología. Universidad de México (3)	*An. Inst. Biol., Méx.*
Chapingo	*Chapingo*
PERU	
Bolet'n Técnico. Chinchina	*Bol. téc., Chinchina*
Boletín Trimestral de Experimentacion Agropecuaria. Lima	*Bol. trim. Exp. agropec., Lima*
URUGUAY	
Anales de la Facultad de Veterinaria de Uruguay	*An. Fac. vet., Urug.*
Archivo Fitotécnico del Uruguay	*Arch. fitotéc., Urug.*
Archivos de la Sociedad de Biologia de Montevideo	*Arch. Soc. Biol., Montevideo*
Boletín de la Facultad de Ingeniería de Montevideo	*Bol. Fac. Ing., Montevideo*
Boletín Informativo. Montevideo	*Bol. inform., Montevideo*
Boletín del Instituto Nacional de Colonización. Uruguay	*Bol. Inst. nac. Colon. Urug.*
Bolet'n Mensual. Uruguay	*Bol. mens., Urug.*
Propaganda Rural. Montevideo	*Prop. rur., Montevideo*
Revista de la Facultad de Ingenieros Agrónomos. Montevideo	*Rev. Fac. Ing. agron., Montevideo*
VENEZUELA	
Agricultor Venezolano	*Agricultor venezol.*
Agronomía Tropical. Maracay	*Agron. trop., Maracay*
Revista de la Facultad de Agricultura. Caracas	*Rev. Fac. Agric., Caracas*
Revista Pecuaria. Caracas	*Rev. Pec., Caracas*
SPAIN	
Agricultura. Madrid	*Agricultura, Madr.*
Anales de Edafología y Fisiología Vegetal	*An. Edafol. Fisiol. veg.*
Anales de la Escuela de Peritos Agrícolas. Barcelona (2)	*An. Esc. Perit. agric., Barcelona*
Anales de la Estación Experimental de Aula Dei (8)	*An. Esta. exp. Aula Dei*
Anales del Instituto Nacional de Investigaciones Agronomicas	*An. Inst. nac. Invest. agron.*
Anales del Jardín Botánico de Madrid	*An. Jard. bot. Madr.*

TITLE	ABBREVIATION USED
SPAIN—*(Continued)*	
Boletín Agro-Pecuario	*Bol. Agro-pec.*
Boletín de Divulgación Ganadera	*Bol. Divulg. Ganad.*
Boletín de Información del Ministerio de Agricultura. Madrid	*Bol. Minist. Agric., Madr.*
Boletín del Instituto Nacional de Investigaciones Agronomicas	*Bol. Inst. nac. Invest. agron.*
Revista del Instituto Agrícola Catalán de San Isidro	*Rev. Inst. agric. catal.*
Siembra	*Siembra*
SWEDEN	
Acta Agriculturae Scandinavia	*Acta agric. scand.*
Acta Phytogeographica Suecica	*Acta phytogeogr. suec.*
Agri Hortique Genetica. Landskrona	*Agri hort. genet., Landskrona*
Botaniska Notiser	*Bot. Notiser*
Forsøk og Forskning	*Forsøk Forskn.*
Hereditas. Lund	*Hereditas, Lund*
Jordbrukarnas Föreningsblad	*Jordbr. FörenBl.*
Kungl Lantbruksakademiens Tidskrift. Stockholm	*K. LantbrAkad. Tidskr., Stockh.*
Kungl Lantbrukshögskolans Annaler	*K. LantbrHögsk. Ann.*
Lantmannen Svenskt Land	*Lantm. Svenskt Land*
Meddelanden från Gullåkers Växtförädlingsanstalt, Hammenhog	*Medd. Gullak. VäxtförädlAnst.*
Meddela den från Jordbrukstekniska Institutet. Uppsala	*Medd. jordbrtek. Inst., Uppsala*
Meddelanden från Statens Centrale Frökontrollanstalt. Stockholm	*Medd. Frökontrollanst., Stockh.*
Socker	*Socker*
Svensk Frötidning	*Svensk Frötidn.*
Svensk Geografisk Årsbok	*Svensk geogr. Årsb.*
Sveriges Utsädesförenings Tidskrift	*Sverig. Utsädesföven. Tidskr.*
Växt-närings-Nytt	*Växt-närings-Nytt*
Vaxtskyddsnotiser. Stockholm	*Vaxtskyddsnotiser, Stockh.* .
Weibulls Årsbok	*Weibulls Årsb.*
Weibulls Illustrerade Årsbok	*Weibulls ill. Årsb.*
SWITZERLAND	
Alpwirtschaftliche Monatsblätter	*Alpw. Mbl.*
Candollea*	*Candollea*
Flugblatt. Eidgenossische Landwirtschaftliche Versuchsanstalt. Zürich-Oerlikon	*Flugbl. Eidg. landw. Versuchsanst., Zürich-Oerlikon*
Landwirtschaftliches Jahrbuch der Schweiz	*Landw. Jahrb. Schweiz*
Mitteilungen der Arbeitsgemeinschaft zur Förderung des Futterbaues	*Mitt. ArbGemeinsch. Förd. Futterbau*
Mitteilungen für die Schweizerische Landwirtschaft	*Mitt. schweiz. Landw.*
Promotionsarbeit. Eidgenossische Technische Hochschule. Zürich	*Promotionsarb., Zürich*
Revue Romande d'Agriculture. Lausanne (2)	*Rev. rom. Agric.*
Schweizerische Landwirtschaftliche Monatshefte	*Schweiz. landw. Mh.*
Reports	
Bericht über das Geobotanische Forschungsinstitut Rübel in Zürich*	*Ber. geobot. ForschInst. Rübel*
Rapport d'Activité de l'Association pour le Développement de la Culture Fourragère. Lausanne	*Rapp. Activité A.D.C.F., Lausanne*
Rapport d'Activité de l'Association Suisse pour l'Essai et l'Approvisionnement en Semenceaux de Pommes de terre	*Rapp. A.S.E.A.S.*
Rapport. Stations Féderales d'Essais Agricoles de Mont-Calme et de Montagibert, Lausanne et Pully	*Rapp. Sta. féd. Essais agric. Mont-Calme., Montagibert, Lausanne et Pully*
Sammelbericht. Schweizerischer Alpwirtschaftlicher Verein	*SammelBer. schweiz. alpw. Verein*
Tätigkeitsbericht. Arbeitsgemeinschaft zur Förderung des Futterbaues	*TätigkBer. ArbGemeinsch. Förd. Futterbau*
Tätigkeitsbericht. Eidgenossische Landwirtschaftliche Versuchsanstalt. Zürich-Oerlikon	*TätigkBer. Eidg. landw. Versuchsanst., Zürich-Oerlikon*

TITLE	ABBREVIATION USED
TURKEY	
Tekel Enstitüleni Rapolari	*Tek. Enst. Rap.*
U.S.A.	
Advances in Agronomy	*Advanc. Agron.*
Agricultural Chemicals	*Agric. Chem.*
Agricultural Engineering, St. Joseph, Michigan	*Agric. Engng, St. Joseph, Mich.*
Agronomy Journal (8)	*Agron. J.*
American Journal of Botany (8)	*Amer. J. Bot.*
American Midland Naturalist (4)	*Amer. Midld Nat.*
American Naturalist	*Amer. Nat.*
American Nurseryman (4)	*Amer. Nurserym.*
American Potato Journal	*Amer. Potato J.*
Analytical Chemistry (8)	*Analyt. Chem.*
Annals of the Missouri Botanical Garden	*Ann. Mo. bot. Gdn*
Annual Review of Biochemistry	*Annu. Rev. Biochem.*
Annual Review of Plant Physiology	*Annu. Rev. Pl. Physiol.*
Arkansas Farm Research	*Ark. Fm Res.*
Better Crops with Plant Food	*Bett. Crops*
Bi-monthly Bulletin of North Dakota Agricultural Experiment Station	*Bi-mon. Bull. N. Dak. agric. Exp. Sta.*
Biological Abstracts. Section D	*Biol. Abstr. Sec. D*
Biometrics (8)	*Biometrics*
Botanical Gazette	*Bot. Gaz.*
Botanical Review (8)	*Bot. Rev.*
Brittonia. New York	*Brittonia, N.Y.*
Bulletin of the Department of Agriculture. California	*Bull. Dep. Agric., Calif.*
Bulletin of the Ecological Society of America	*Bull. ecol. Soc. Amer.*
Bulletin of the Torrey Botanical Club (2)	*Bull. Torrey bot. Cl.*
Butler University Botanical Studies	*Butler Univ. bot. Stud.*
California Agriculture	*Calif. Agric.*
Cereal Chemistry	*Cereal Chem.*
Contributions from Boyce Thompson Institute for Plant Research (8)	*Contr. Boyce Thompson Inst.*
Corn	*Corn*
Dissertation Abstracts (4)	*Diss. Abstr.*
Down to Earth	*Down to Earth*
Dupont Agricultural News-Letter (2)	*Dupont agric. News-Lett.*
Ecological Monographs	*Ecol. Monogr.*
Ecology	*Ecology*
Economic Botany	*Econ. Bot.*
Economic Geography	*Econ. Geogr.*
Farm Chemicals	*Fm Chem.*
Farm and Home Research	*Fm Home Res.*
Foreign Agriculture	*Foreign Agric.*
Geographical Review	*Geogr. Rev.*
Growth	*Growth*
Hilgardia	*Hilgardia*
Hoard's Dairyman (14)	*Hoard's Dairym.*
Iowa Farm Science	*Iowa Fm Sci.*
Iowa State College Journal of Science*	*Iowa State Coll. J. Sci.*
Journal of Agricultural and Food Chemistry (8)	*J. agric. fd Chem.*
Journal of Animal Science (8)	*J. Anim. Sci.*
Journal of Applied Physics (8)	*J. appl. Phys.*
Journal of the Arnold Arboretum (4)	*J. Arnold Abor.*
Journal of the Association of Official Agricultural Chemists. Washington (8)	*J. Ass. off. agric. Chem., Wash.*
Journal of Dairy Science (8)	*J. Dairy Sci.*
Journal of Economic Entomology (4)	*J. econ. Ent.*
Journal of the Elisha Mitchell Scientific Society (5)	*J. Elisha Mitchell sci. Soc.*

TITLE	ABBREVIATION USED
U.S.A.—(*Continued*)	
Journal of Forestry (4)	*J. For.*
Journal of Heredity	*J. Hered.*
Journal of Nutrition	*J. Nutr.*
Journal of Range Management	*J. Range Mgmt*
Journal of Soil and Water Conservation (7)	*J. Soil Wat. Conserv.*
Lloydia (2)	*Lloydia*
New Jersey Agriculture	*N. J. Agric.*
New Phytologist (8)	*New Phytol.*
Ohio Journal of Science (3)	*Ohio J. Sci.*
Our Public Lands	*Our Publ. Lands*
Papers from the Michigan Academy of Science, Arts and Letters (5)	*Pap. Mich. Acad. Sci.*
Phytologia	*Phytologia*
Phytopathology (8)	*Phytopathology*
Plant Disease Reporter	*Pl. Dis. Reptr*
Plant Food Journal	*Pl. Fd J.*
Plant Physiology	*Pl. Physiol.*
Poultry Science (8)	*Poult. Sci.*
Prairie Farmer	*Prairie Fmr*
Proceedings of the American Society of Horticultural Science (2)	*Proc. Amer. Soc. hort. Sci.*
Proceedings of the American Society of Sugar Beet Technologists	*Proc. Amer. Soc. Sug. Beet Technol.*
Proceedings of the Association of Official Seed Analysts of North America	*Proc. Ass. off. Seed Anal. N. Amer.*
Proceedings of the Indiana Academy of Science	*Proc. Ind. Acad. Sci.*
Proceedings of the Iowa Academy of Science	*Proc. Iowa Acad. Sci.*
Proceedings of the Oklahoma Academy of Science	*Proc. Okla. Acad. Sci.*
Proceedings of the Soil Science Society of America	*Proc. Soil Sci. Soc. Amer.*
Proceedings of the Utah Academy of Sciences, Arts and Letters	*Proc. Utah Acad. Sci.*
Quarterly Bulletin. Michigan Agricultural Experiment Station	*Quart. Bull. Mich. agric. Exp. Sta.*
Quarterly Review of Biology	*Quart. Rev. Biol.*
Report of the Inter-American Institute of Agricultural Sciences	*Rep. Inter-Amer. Inst. agric. Sci.*
Research and Farming. North Carolina	*Res. and Fmg, N. C.*
Research. Quarterly Review. Rhode Island	*Research. Quart. Rev., Rhode Is.*
Research Studies. State College of Washington	*Res. Stud. State Coll. Wash.*
Review of Scientific Instruments (8)	*Rev. sci. Instrum.*
Rice Journal	*Rice J.*
Science	*Science*
Science for the Farmer	*Sci. Fmr*
Seed Trade Buyers' Guide	*Seed Tr. Buy. Guide*
Seed World	*Seed World*
Soil Science (8)	*Soil Sci.*
Southern Planter	*Sth. Planter*
Soybean Digest	*Soybean Dig.*
Spreckels Sugar Beet Bulletin	*Spreckels Sug. Beet Bull.*
Sugar Beet Journal	*Sug. Beet J.*
Sugar Bulletin	*Sug. Bull.*
Sugar Scoop	*Sug. Scoop*
Technical Digest. Washington	*Tech. Dig., Wash.*
Through the Leaves	*Thro. Leaves*
Transactions of the Kansas Academy of Science	*Trans. Kans. Acad. Sci.*
Transactions of the Wisconsin Academy of Sciences, Arts and Letters	*Trans. Wis. Acad. Sci.*
United States Golf Association Journal	*U.S. Golf Ass. J.*
Weeds	*Weeds*
Westland Pasture Journal	*Westld Past. J.*

U.S.A.—(*Continued*)

Reports from Agricultural Experiment Stations in :

Alabama	*Ala*	Nebraska	*Neb.*
Alaska	*Alaska*	New Hampshire	*N.H.*
Arizona	*Ariz.*	New Jersey	*N.J.*
Arkansas	*Ark.*	New York State	*N.Y.*
California	*Calif.*	North Carolina	*N.C.*
Colorado	*Colo*	North Dakota	*N. Dak.*
Connecticut	*Conn.*	Ohio	*Ohio*
Cornell (N.Y.)	*Cornell*	Oklahoma	*Okla.*
Florida	*Fla*	Oregon	*Ore.*
Georgia	*Ga*	Pennsylvania	*Pa*
Illinois	*Ill.*	Rhode Island	*R. I.*
Indiana	*Ind.*	South Carolina	*S. C.*
Iowa	*Ia*	Texas	*Tex.*
Louisiana	*La*	Utah	*Utah*
Maine	*Me*	Vermont	*Vt*
Massachusetts	*Mass.*	Virginia	*Va*
Michigan	*Mich.*	Washington	*Wash.*
Minnesota	*Minn.*	West Virginia	*W. Va*
Mississippi	*Miss.*	Wisconsin	*Wis.*
Missouri	*Mo.*	Wyoming	*Wyo.*

U.S.S.R.

Agrobiologija (5)	*Agrobiologija* (*Agrobiology, Moscow*)
Biohimija	*Biohimija* (*Biochemistry, Leningr.*)
Botaničeskiĭ Žurnal. Kiev	*Bot. Ž., Kiev* (*Bot. J., Kiev*)
Botaničeskiĭ Žurnal. SSSR	*Bot. Ž., SSSR* (*Bot. J., USSR*)
Doklady Akademii Nauk. SSSR	*Doklady Akad. Nauk, SSSR* (*Proc. Acad. Sci., USSR*)
Dostiženija Nauki i Peredovoĭ Opyt v Seljskomihozjaĭstve	*Dost. Nauki. Pered. Opyt seljsk.* (*Achiev. Sci. Adv. exp. Agric.*)
Fiziologija Rasteniĭ	*Fiziol. Rast.* (*Pl. Physiol., USSR*)
Hlopkovodstvo	*Hlopkovodstvo* (*Cott. Prod.*)
Izvestija Akademii Nauk. SSSR	*Izv. Akad. Nauk, SSSR* (*Bull. Acad. Sci., USSR*)
Izvestija Timirjazevskoĭ Seljskohozjaĭstvennoĭ Akademii	*Izv. Timirjazevsk. seljsk. Akad.* (*Bull. Timirjazev agric. Acad.*)
Kolhoznoe Proizvodstvo (3)	*Kolhoz. Proizvod.* (*Collect. Fm Prod.*)
Počvovedenie	*Počvovedenie* (*Pedology, Moscow*)
Priroda. Moskva	*Priroda, Moskva* (*Nature, Moscow*)
Socialističeskoe Seljskoe Hozjaĭstvo	*Soc. seljs. Hoz.* (*Social. Agric.*)
Trudy Botaničeskogo Instituta V.L. Komarova	*Trudy Bot. Inst. V.L. Komarova* (*Trudy Inst. bot. Acad. Sci., USSR*)
Trudy Instituta Fiziologii Rastenii im. K.A. Timirjazeva	*Trudy Inst. Fiziol. Rast. Timirjazeva* (*Trudy Timirjazev Inst. Pl. Physiol.*)
Uspehi Sovremennoĭ Biologii (13)	*Usp. Sovrem. Biol.* (*Adv. mod. Biol., Moscow*)
Zemledelie	*Zemledelie* (*Agriculture, USSR*)

WEST INDIES

Caribbean Economic Review	*Caribb. econ. Rev.*
Farmer. Kingston, Jamaica	*Farmer, Kingston, Jam.*
Journal of the Agricultural Society of Trinidad and Tobago (2)	*J. agric. Soc. Trin. Tob.*
Journal of Agriculture of the University of Puerto Rico	*J. Agric. Univ. P. R.*
Revista de Agricultura. Habana	*Rev. Agric., Habana*
Revista de Agricultura. Puerto Rico	*Rev. Agric., P. R.*
Tropical Agriculture. Trinidad	*Trop. Agric., Trin.*

TITLE	ABBREVIATION USED

WEST INDIES—(*Continued*)

Reports

Report of the Agricultural Experiment Station. Puerto Rico	*Rep. agric. Exp. Sta., P. R.*
Report of the Department of Agriculture. Antigua	*Rep. Dep. Agric. Antigua*
Report of the Department of Agriculture. Dominica	*Rep. Dep. Agric. Dominica*
Report of the Department of Agriculture. Jamaica	*Rep. Dep. Agric. Jam.*
Report of the Department of Agriculture. Leeward Islands	*Rep. Dep. Agric. Leeward Is.*
Report of the Department of Agriculture. St. Vincent	*Rep. Dep. Agric. St. Vincent*
Report of the Department of Agriculture. Trinidad and Tobago	*Rep. Dep. Agric. Trin. Tob.*
Report of the Department of Agriculture. Virgin Isles	*Rep. Dep. Agric. Virgin Is.*
Report of the Department of Science and Agriculture. Barbados	*Rep. Dep. Sci. Agric. Barbados*

YUGOSLAVIA

Arhiv za Poljoprivredne Nauke	*Arhiv polj. nauke*
Bulletin Scientifique	*Bull. Sci.*
Conseil des Academies de la RPF, Yougoslavia	*Con. Acad. RPF, Youg.*
Veterinaria. Sarajevo	*Veterinaria, Sarajevo*
Veterinarski Archiv. Zagreb	*Vet. Archiv, Zagreb*

ZANZIBAR

Report of the Department of Agriculture. Zanzibar	*Rep. Dep. Agric. Zanzibar*

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(1) Commonwealth Bureau of Animal Nutrition, Aberdeen.

(2) Commonwealth Bureau of Horticulture and Plantation Crops, East Malling, Kent.

(3) Commonwealth Bureau of Plant Breeding and Genetics, Cambridge.

(4) Commonwealth Forestry Bureau, Oxford.

(5) Commonwealth Mycological Institute, Kew.

(6) Royal Botanic Gardens, Edinburgh.

(7) Rothamsted Experimental Station, Harpenden.

(8) Grassland Research Station, Hurley, Berkshire.

(9) Commonwealth Bureau of Agricultural Parasitology, St. Albans.

(10) Commonwealth Entomological Institute, London.

(11) Commonwealth Bureau of Dairy Science, Shinfield.

(12) Department of Scientific and Industrial Research, London.

(13) Commonwealth Bureau of Animal Breeding. Edinburgh.

(14) National Institute of Research in Dairying, Shinfield.

Publications scrutinized at Oxford libraries other than (4) are indicated by an asterisk.

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REVIEW ARTICLE

THE CONTROL OF WEEDS IN CEREAL CROPS IN EUROPE BY CHEMICAL METHODS

BY

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HISTORICAL

Chemical methods were first used for the control of weeds in cereals sixty years ago. For the first forty years of this period the technique was extended to few other crops, and, in consequence, the early history of chemical control is almost wholely concerned with cereals (Rabaté, 1927 and Blackman, 1945). The rapid progress that took place in the use of fungicidal and insecticidal sprays during the latter part of the 19th century undoubtedly stimulated the search for chemicals that would kill weeds. During 1895, Bonnet in France, Bolley in America and Schultz in Germany each separately discovered that a dilute solution of copper sulphate, when sprayed on to cereal crops, killed *Sinapis arvensis* (charlock) without injuring the cereal. These early workers used, in addition to copper sulphate, other substances such as ferrous sulphate, sodium chloride, sulphuric and nitric acids, as well as fertilizers such as calcium cyanamide, ammonium sulphate, sodium nitrate and kainite.

Copper sulphate, however, seems to have been the chemical most generally accepted (Brenchley, 1920) used as a solution of about 3-5% applied at about 50 gal. per acre. Other copper salts were tested, and, although as early as 1899 it was reported (Rabaté, 1927) that copper nitrate was superior to copper sulphate, no detailed evaluation of the different salts was undertaken until Blackman (Blackman *et al.*, 1949) showed that cupric chloride was more effective than either the copper nitrate or sulphate.

The advantages of sulphuric acid, a quick-acting spray effective against a wide range of annual weeds, were not fully realised until the work of Rabaté in 1911 who showed that under French conditions good weed eradication and considerable increases in yield could be obtained (Rabaté, 1927). It was many years later that other countries followed this lead. Korsmo's (1932) work in Norway and later that of Blackman and Templeman (1936) in England, established the effectiveness of sulphuric acid for weed control in cereals, and led to its adoption on a limited scale in other European countries.

The next important advance came with the discovery by Truffaut and Pastac (1932) that yellow dye-stuffs such as 2,4-dinitro phenol (DNP) and 3,5-dinitro-o-cresol (DNC) effectively controlled a wide range of annual weeds in cereal crops. The preliminary French findings were followed by detailed work in the USA (Westgate and Raynor, 1940) and later in the U.K. (Blackman and Roberts, 1950, 1950a) with the results that at the present time DNC is used extensively for weed control in both spring-sown and winter-sown cereals, particularly in the U.K. and the Netherlands. 2,4-dinitro-6-secondary butyl phenol (dinoseb) is also employed widely in Norway for the same purpose.

The selectivity of the weedkillers mentioned so far is dependent on the differences in the habit of growth of cereals and weeds. Cereals with their waxy, narrow, upright leaves and their protected growing points are not vulnerable to chemicals that kill mainly where they lodge, as are annual weeds that have flat leaves and an exposed apical growing point. Chemicals that are selectively toxic to weeds mainly because they affect the metabolic processes of the weed and not the crop were first discovered in 1941 (Sexton *et al.*, 1941). The discovery reported by Slade, Templeman and Sexton (1945) that certain plant growth regulating substances killed some plants and not others started a completely new era in the use of chemicals for weed control. It led to the development of the two most important weedkillers yet discovered : 2-methyl-4-chlorophenoxyacetic acid (MCPA) ; and 2,4-dichlorophenoxyacetic acid (2,4-D). 2,4-D and MCPA are now used for the control of weeds growing in many millions of acres of cereal crops in Europe and on an even more extensive scale in North America. Their discovery, which was also made independently in America a little later (Hamner and Tukey, 1944 ; Marth and Mitchell, 1944) could not be disclosed until after the war. In consequence, much of the European work, apart from that carried out in Great Britain (Blackman, 1945a; Templeman, 1946) was not started until 1946.

These two chemicals were superior to any that had previously been used for cereals, primarily

because they were truly selective in their action ; but also because they were effective in such small amounts, were neither poisonous nor corrosive and could be applied either as dusts or sprays. Their immediate success as selective weedkillers for many crops spurred others to look for different types of synthetic growth regulators that might be even better. After ten years, however, the only new chemicals of any promise for weed control in cereals are the substituted ω-(phenoxy) butyric acids discovered by Wain (1955). He concluded that the ω-aryloxy alkyl carboxylic acids with an uneven number of methylene groups in the side chain are converted in some plants to the active acetic derivative and that plants differ considerably in their ability to accomplish this β-oxidation. This means that plants differ in their ability to convert an inactive substance, such as 2-methyl-4-chlorophenoxy butyric acid (MCPB), into an active substance, MCPA, and that in consequence it is possible to obtain greater selectivity by using MCPB rather than MCPA, or ω-2,4-dichlorophenoxy butyric acid (2,4-DB) rather than 2,4-D. Preliminary work (Carpenter and Soundy, 1955; Wain, 1955a) has shown that MCPB and 2,4-DB are less toxic to cereals and some legumes than the corresponding acetic acids and yet are nearly as toxic to several weed species. On the other hand, MCPB and 2,4-DB are markedly less toxic to some of the commonest weeds such as *Raphanus raphanistrum* (runch) and *Sinapis arvensis* (charlock) and their selectivity, when these weeds are present in cereals, may be less than the corresponding acetics. It is too early to judge the precise usefulness of these new chemicals. After 10 years we are only just beginning to obtain a clear picture of the many factors that affect the action of 2,4-D and MCPA and several years will be required for the proper evaluation of the ω-(phenoxy) butyric acids.

The only other chemicals that have been employed for weed control in cereals are those that are applied in the autumn before the cereal is sown in the spring. Sodium chlorate (Aslander, 1951) and trichloracetic acid (Osvald and Åberg, 1955) have both been tested for this purpose but neither of them is very satisfactory. Sodium chlorate has been used for many years ; like trichloracetic acid its effect is dependent on climatic conditions and soil. Trichloracetic acid, which according to Åberg (Åberg *et al.*, 1952) was discovered almost simultaneously and quite independently in both Finland and the USA, has been recommended (Osvald and Åberg, 1952) for the control of perennial grasses, such as *Agropyron repens*, but it may soon be superseded for this purpose by 2,2-dichloropropionic acid (Osvald and Åberg, 1955) which, unlike trichloracetic acid, is absorbed by the leaves of the grasses as well as by the roots.

Although all the chemical methods of weed control in cereals that have been mentioned, except the use of 2,2-dichloropropionic acid, originated in Europe, much of the agronomic research concerned with the field assessment of these chemicals, particularly 2,4-D, has been carried out in North America. This review is not directly concerned with the many papers that have been written on this subject outside Europe, but it is important to realise that the American and Canadian work, which has been reported in great detail in the last ten years, has influenced developments in Europe.

The Use of Weedkillers in Europe

As has been mentioned, it takes many years of field experimentation to determine the real agricultural value of a new chemical weedkiller. The requirements, even if limited to cereals, vary from country to country and are determined primarily by the type of farming and the species of weeds. Over the years, the comparative usefulness of the various types of weedkiller has been assessed (British Weed Control Council, 1956 ; Slaats and Stryckers, 1954 ; Vidme, 1951 ; Zonderwijk, 1954 ; Rademacher, 1940). Many countries have issued recommendations concerning the weedkillers to use in different situations, and it might have been expected that there would have been a similarity in the recommendations made and in the amounts of the different weedkillers which are applied. Such uniformity does not seem to be the case, for the proximity to the source of supply and the different systems of agriculture practised in the different countries only partly determine the types of weedkillers employed in practice. In the Netherlands, for instance, where both winter and spring cereals are grown, DNC is used almost exclusively and the percentage of the cereal acreage sprayed with DNC varies from about 80-90 for oats and winter rye down to 20-40 for winter barley and wheat. In Sweden, on the other hand, very little DNC is used ; about 15% of the cereal acreage is sprayed with MCPA, while 24% is sprayed with a range of other herbicides, such as sodium chlorate, calcium cyanamide, sulphuric acid and cupric chloride. In Norway it is estimated that 25-30% of all the cereals that are grown are sprayed and that 80% of the spraying is with MCPA, 12% with dinoseb and about 5% with sulphuric acid. 2,4-D is not used at all in Norway and only to a very limited extent in other Scandinavian countries, the Netherlands and Denmark. In France and the U.K., however, MCPA and 2,4-D are both used, while in Austria and Germany 2,4-D is used almost exclusively. In Belgium, where the acreage of spring and winter cereals is very similar, about 12% of the cereal acreage is treated with calcium cyanamide, 10% with the ' dinitros ' mostly DNC (ammonium) and about 15% with MCPA and 2,4-D. In Great Britain during 1955, about 22% of the cereal acreage was sprayed with MCPA, 2,4-D and MCPB and less than 5% with DNC.

Economics

The cost of a weedkiller treatment must be related to the advantages that can be expected in the way of increased yield due to lack of weed competition, easier harvesting and less weed seed in the soil. Estimates of the losses in yield caused by weeds growing in cereal crops have been made in several European countries. The most comprehensive were by Korsmo (1930, 1932) who carried out 3552 simple experiments during the period 1916-23 and showed that the average yield increase from various methods of weed control was 21·1%. In Germany, Wiede (1950) calculated that the gain in yield as the result of weed control by 2,4-D was about 21%. Riepma (1955) in the Netherlands estimated, from a series of field experiments laid down especially for the purpose, that weed suppression increased yields by 10% on sandy soils and 5% on clay soils. In the U.K. Blackman, Holly and Roberts (1949) averaging the results of three years' experiments with several weedkillers, obtained a figure of 23% gain in yield.

The cost of using weedkillers can be divided into the expense of the chemical and of the application. Estimates made by the School of Agriculture, Cambridge (1954) show that the cost of application is usually higher than the price of the chemical and that when farmers with less than 300 acres do their own spraying it costs about twice as much to spray a high volume of liquid per acre as it does to spray a low volume.

Application Volume Rate

It is only within the last ten years that much attention has been paid to the method of applying weedkillers. In the past, water-soluble substances such as the copper salts were sprayed at relatively high volumes of about 50-100 gal. per acre, while the solids were distributed as dusts by means of ordinary fertilizer distributors. At first, MCPA was applied chiefly as a dust, probably because fertilizer distributors were much more readily available than spraying machines. It was soon shown, however, that the efficiency of MCPA as a dust was only about half its efficiency as a liquid, and dusting gave place to spraying. The volumes of liquid used at first were high, about 100 gal. per acre, but as the result of developments, chiefly in North America, spraying machines were manufactured in Europe capable of applying very low volumes of spray per acre. At the present time most of the spraying of cereal crops with MCPA or 2,4-D in the U.K. is done at rates between 5 and 20 gal. per acre.

Very little field or laboratory work has been undertaken to ascertain the real effects of varying the amount of liquid used for the application of weedkillers. The response of cereals to MCPA and 2,4-D does not seem to be affected appreciably by changes in the volume of spray liquid applied (Holly, 1952 and Hellqvist, 1952). Fryer (1953) and Elliott (1953) in an extensive series of experiments with weed-free crops of oats, barley and wheat compared the effects of 2,4-D (amine) applied at 7 and 80 gal. per acre, and found no consistent differences. Changes in the volume of spray applied do, however, affect the response of some weeds (Holly, 1952 ; Hellqvist and Bengtsson, 1955), but because the response is dependent on so many factors it is very rarely possible to predict what will happen under field conditions. MCPA and 2,4-D are readily translocated in most plants, and, in consequence, behave quite differently from contact weedkillers such as sulphuric acid and DNC. Sulphuric acid is usually applied to cereals as a 5-10% solution at the rate of about 100 gal. per acre. The sodium and ammonium salts of DNC are relatively insoluble in water and thus high volume sprays (60-100 gal. per acre) are employed.

At the present time the two most important types of weedkillers for cereals are the dinitro compounds and the growth regulating substances, particularly DNC, MCPA and 2,4-D. By the proper application of these chemicals it is possible to control most of the annual weeds of cereal crops, except wild oats (*Avena fatua* and *A. ludoviciana*) and to check the growth of many perennial, dicotyledonous weeds. The remainder of this paper is devoted to a detailed consideration firstly, of DNC and secondly of MCPA and 2,4-D.

DNC

For many years DNC was sold as a paste of the sodium salt which was diluted, and sprayed as a suspension. Harris and Hyslop (1942) in America then demonstrated that the efficiency of the spray solution was enhanced by the addition of ammonium sulphate. Parallel investigations in Great Britain (Blackman, 1945) showed that the ammonium salt and a suspension of DNC were both more toxic than the sodium salt. Nowadays commercial preparations are usually based on the ammonium salt although 'micronised' suspensions of DNC are being developed. Other homologues of DNC have been tested. Crafts (1945) found that dinoseb was more toxic than DNC to weeds but less toxic to legumes and this was confirmed in England (Roberts and Blackman, 1950). Dinoseb is, however, also more toxic to cereals and seems to be less selective than DNC for weed control in cereals. Nevertheless, it does have definite advantages over DNC for the treatment of cereals undersown with clovers and grasses and of cereal/legume mixtures.

Practical experience with DNC has shown that it kills a very wide range of annual weeds and that it may be safely applied either to spring- or winter-sown cereals once the cereal has produced a few leaves. It can also be used for cereals undersown with clovers and grasses provided the drilling of the undersown crop is delayed until after the

chemical has been applied. The chief drawback is that this compound, like dinoseb, is very toxic to animal life and has to be applied with care. In the U.K. compulsory safety precautions governing the use of this group of compounds have been introduced (Agriculture Regulations, 1955). Recommendations for their use and the susceptibility of different weed species are given in the agricultural literature of many countries (British Weed Control Council, 1956; Zonderwijk, 1954; Commission des Semences et des Progrès Techniques de la Production des Céréales, 1954a ; Bremer and Orth, 1955). High volume applications are generally recommended. The phytotoxic action is dependent on environmental factors and it is claimed (Woodford, 1950) that DNC and dinoseb respond differently to changes in temperature. Winter applications of DNC have, however, proved very satisfactory (Pfeiffer, Gregory and Holmes, 1955). Von Hofsten (1954) claimed that humidity is more important than temperature.

DNC is used to a much greater extent in the Netherlands than in any other country and the Dutch have made some interesting observations on the effects of DNC when applied to weed-free crops of winter cereals. In 1950, Eggink and Riepma (Eggink, 1952 ; Eggink and Riepma, 1951) showed that applications of DNC to weed-free crops of winter rye and winter wheat increased their yield. These findings have since been confirmed and amplified by Riepma (1953, 1955) who has now shown that yield increases of about 10% can be obtained if the DNC is applied to winter rye or winter wheat in the 4-leaf stage and that the increase is not due to the nitrogen in the DNC.

MCPA and 2,4-D

MCPA and 2,4-D became available in small quantities to most European countries about 1946. Since that time research workers in many of these countries have been carrying out field experiments in order to determine the place that these weed-killers could fill in the agriculture of their respective countries. Both compounds were considered in the early work in England (Slade *et al.*, 1945 ; Blackman, 1945a), but it soon became evident that MCPA was less toxic to cereals, nearly as toxic to most weed species and more toxic to one or two weeds. On the whole, therefore, it was judged to be more selective than 2,4-D and was used almost exclusively until 1950. Similarly in other European countries the greater selectivity of MCPA has generally been preferred. This choice is in direct contrast to the development in North America where MCPA was considered a ' new herbicide' until a few years ago, and where practically all cereal spraying is done with 2,4-D. The reasons for this difference in outlook are undoubtedly more economic than scientific. In America the phenols required for the manufacture of 2,4-D are readily obtainable and the cresols required for the manufacture of MCPA are scarce, while in the U.K. the situation is almost the reverse. In consequence, 2,4-D is about half the price of MCPA in North America but about the same price in the U.K.

Much of the agronomic work with MCPA and 2,4-D was concerned with their relative toxicity to different weed species. Lists of the susceptibility of annual and perennial weeds to these compounds have appeared in many countries (Osvald and Åberg, 1952 ; British Weed Control Council, 1956 ; Longchamp *et al.*, 1950 ; Stryckers, 1952, Stummeyer, 1951). From this work it soon became clear that the young weed seedlings grow in resistance as they grow older and that the earlier the chemical is applied the smaller the amount that is required for weed control. Unfortunately, cereals are also most susceptible at an early stage of growth and the most opportune time to spray, in order to obtain maximum selectivity between crop and seedling weeds, is usually not until after the cereals have tillered. Mature perennial weeds, on the other hand, are usually most susceptible when in full bud. This stage of development is often reached when the cereal is well grown and is entering another susceptible growth stage associated with ' shooting' and flowering. In consequence, it is often necessary to make a compromise between maximum effect on the weeds and minimum damage to the crop.

The toxicity of MCPA and 2,4-D to different cereals and cereal varieties has been considered by many workers (Gysel, 1951 ; Slaats and Stryckers, 1951). It is generally agreed that 2,4-D is more toxic than MCPA to all cereals (British Weed Control Council, 1956 ; Longchamp *et al.*, 1950 ; Hagsand, 1954) but particularly to oats (Fryer, 1954 and Rademacher, 1955). Varieties of cereals vary in their response to both compounds and many detailed experiments have been carried out (Scragg, 1953 ; Bachthaler, 1955 ; Pedersen *et al.*, 1948) particularly by Longchamp in France (Longchamp *et al.*, 1952). The relative toxicity of these two chemicals to cereals was reviewed by Allen (1952) who pointed out that it was impossible to generalise about the comparison because it was determined by so many biological and chemical factors. The relative toxicity is also influenced by the stage of growth of the cereal and by the nature of the chemical derivative used. As a rule esters are more toxic than amines which in turn are more toxic than metal salts, but the relative efficiencies of the ester, amine and metal salts are also dependent on the nature of the parent acid. The difficulties of trying to compare MCPA and 2,4-D on the basis of a single chemical derivative have been pointed out by Ripper and Baker (1952).

The effects of MCPA and 2,4-D on cereals have usually been measured in terms of yield. The maximum amounts of each chemical that can be applied to cereals at different stages of develop-

ment are quoted in the official recommendations of many countries (British Weed Control Council, 1956 ; Zonderwijk, 1954 ; Stummeyer and Hanf, 1954). Where 2,4-D is recommended, its use is generally limited to wheat, barley and rye up to about 1 lb. per acre. MCPA is used on all cereals at doses up to about 2 lb. per acre of the metal or amine salt. The effects on quality of wheat have been studied by Noulard (1951) and Bure (1951), on oats by Waterson (1954) and on barley by Elliott (1954). The chemicals may also affect the straw. Mashtakov *et al.* (1954) thought that 2,4-D increased the straw strength of bread cereals but overdoses usually cause lodging (Bockman 1954). French workers have noted that applications of the ethyl ester of 2,4-D may increase the incidence of stem rust and ergot (Longchamp *et al.*, 1950 ; 1951a).

Assessments of yield and grain quality are standard practice in cereal experiments designed to determine the beneficial effects of cultural or fertilizer treatments. In experiments with MCPA and 2,4-D, on the contrary, the experimenter is chiefly concerned with the toxic effects of the chemicals and has other crop responses to measure. It has been shown, for instance, that the anatomical abnormalities that MCPA and 2,4-D cause, particularly in the spike, are very sensitive indicators of toxicity which can be assessed quantitatively. Such a method of assessment has been used effectively by Fryer (1954) and Elliott (1954) in a series of widely distributed experiments designed to determine the maximum dose of 2,4-D (amine) that can safely be applied to wheat, barley and oats. They and others (Longchamp *et al.*, 1951) have found, however, that it is very difficult to correlate head abnormalities with changes in yield.

One of the first descriptions of these abnormalities in barley in Europe was given by Åberg and Denward (1947). Since that time many photographs and drawings have appeared depicting the effects of MCPA and 2,4-D on the leaves, heads, panicles and florets of different cereals (Large and Dillon Weston, 1951 ; Longchamp *et al.*, 1951). Most of these have been largely descriptive and have done little more than indicate qualitative differences between the cereals. Barley, for example, seems to be more easily deformed than wheat or oats, while abnormalities in the panicle of oats are not so distinct as in the head of wheat or barley. Andersen (1954) (Andersen and Hermansen, 1950) has, however, attempted to analyse the situation and in a very interesting series of papers has described the relationship that exists between the stage of development of the shoot apex at the time of treatment with the weedkiller and the number of abnormalities that occurs in the heads that finally mature. Similar experiments have been reported by Myers (1954) and it is now well established that it is the stage of development of the growing shoot primordia, at the time the growth regulator is applied, that determines the type of abnormalities that are eventually produced. If the chemical is applied at the time when leaf initials are being laid down in the shoot, then deformed leaves, often tubular and completely enclosing the head, will be formed. If the application is made slightly later, during spikelet initiation, then abnormal spikelets and deformed heads will result. But application made after the complete ear has been laid down will have little effect on the final development of the grain or the head. The amount of chemical applied and the method of application will influence the degree of deformity, and, in addition, different cereals and varieties will respond in slightly different ways (Longchamp *et al.*, 1951). 2,4-D causes deformities in wheat, oats and barley at much lower doses than MCPA, but the difference between the two compounds seems to be greatest for oats.

In order to facilitate the identification in the field of the ' susceptible ' period of different cereals attempts have been made to relate the number of leaves on the main stem to the stage of development of the spike primordia (Andersen, 1952), and, although the linearity of this relationship is influenced by variety, seed rate and environment (Andersen, 1955) it is accurate enough for most practical purposes. Andersen (1952a) states that barley has passed the most susceptible stage when it has grown 3·5 leaves and that oat is most susceptible when it has 4-6 leaves (Andersen and Hermansen, 1950). In Great Britain it has been shown (Myers, 1954) that by the time 5-6 leaves have developed on the main axis then the susceptible stage for most cereals has passed. There are, however, differences between the cereals in the way in which the head primordia are laid down. For instance, the development of the primordia of oats does not follow such an obvious pattern as that for wheat or barley and the oat crop is less liable to be affected by MCPA or 2,4-D if treated at the 1- to 3-leaf stage. This characteristic of oats has definite practical advantages, for, as Elliott and Fryer (1955) and Breese and Hirst (1955) have demonstrated, MCPA can be used for the control of weeds in this crop at a much earlier stage than is practicable in barley or wheat.

The effect of MCPA and 2,4-D on the grasses and clovers that are sown in association with cereals is of considerable practical importance. The doses of these compounds that are normally used for weed control in pure stands of cereals are toxic to young clovers in the 1- to 2-true-leaf stage, and official recommendations, usually advise against their use in such crops (British Weed Control Council, 1956). Neverthless, considerable acreages of cereals undersown with grass/clover mixtures are sprayed with MCPA or 2,4-D every year without any obvious harmful effects. Practical experience has shown that the selectivity is usually

great enough when there is sufficient weed and cereal cover present to protect the young legume, and the dominant weed is susceptible enough to be killed by a very low dose. Recent research has shown that white clover (*Trifolium repens*) is slightly more susceptible to MCPA than to 2,4-D and that red clovers are definitely more susceptible to 2,4-D (Ochiltree, 1954 ; Scragg, 1954a). This finding should greatly assist the grower in the correct choice of weedkiller and it is probable that the new compounds, MCPB and 2,4-DB, will further help him in certain associations of weed and crop.

Conclusion

The usefulness of a chemical weedkiller is determined by its selective toxicity to weed and crop, its price and the ease with which it can be applied. In a paper primarily concerned with the responses of a crop it is perhaps inevitable that a somewhat unbalanced picture should have been presented. Reference has been made to the susceptibility of different weed species but no attempt has been made to discuss this aspect of the problem in any detail, nor to indicate the precise capabilities of the various weedkillers that are available. Chemical weed control is an aspect of agricultural science which is still in its infancy. It has been studied more in relation to cereals than to any other crop. Nevertheless, there are weeds such as wild oat (*Avena fatua*) which still defy chemical methods of control and there is still a need for new chemicals and new techniques.

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FIELD CROPS

CEREALS

WHEAT

1 JAHTENFELJD, P. A. and ZJUSJKO, Ja. G. **[The dependence of spring wheat yields on soil density in Western Siberia.]** [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 4, 20-2.

2 De CAESTECKER, K. and De LEENHEER, L. Stoppeldichtheden als maatstaf voor kieming en uitstoeling van graangewassen. **[Stubble density as a criterion of germination and tillering in cereal crops.]** *Meded. Landb-Hogesch., Gent* 1954, **19,** No. 2, 88-97, bibl. 2.

Data are given showing the relation between values for plant densities and stem population densities in barley and winter wheat grown on soils with good and poor structure. The results showed that though initial seedling stands were greatly influenced by soil conditions, ultimate stem densities were much less affected owing to the extensive tillering on poor soils. Tillering appeared to be relatively unaffected by soil structure. Data given of ear weights and grain yields showed that while the ear weights of crops growing on poor soils and at relatively low stem densities were, in a number of cases, as high as, or higher than, those of crops growing on good soils, this went only a small way towards compensating for the low plant and stem populations and low grain yields, on poor soils. Ear weights on 4 plots with good soil had an extreme variation of only 9%, compared with up to 50% on plots with poor soil.—P.J.B.

3 HORE, H. L. and SIMS, H. J. **Fallow cultivation trials at Longerenong College.** *J. Dep. Agric. Vict.* 1955, **53,** Pt. 6, 263-4, illus.

Fallow cultivation trials were carried out from 1927-34, 1936-42, and 1946-53 in the Wimmera district on a fallow/wheat/oats or a fallow/wheat rotation. In each trial, wheat yields were similar after summer and winter fallows, but higher than from late- or non-fallowed land. Summer fallowing with a scarifier was as beneficial to wheat yields as when a plough was used. Stubble-burning also resulted in higher wheat yields.—M.P.

4 O'BRIEN, E. J. and MOSS, H. J. **Quality characteristics of the Victorian wheat crop—season 1954-55.** *J. Dep. Agric. Vict.* 1955, **53,** Pt. 9, 393-99, illus.

5 MILLINGTON, A. J. **The protein content of some Australian wheat varieties.** *J. Aust. Inst. agric. Sci.* 1955, **21,** No. 2, 59-68, bibl. 15, illus.

Results of grain and plot yields from variety trials carried out in Queensland, South Australia and Western Australia generally support the suggestion that there is a tendency in a region towards a constant yield of protein per ac. The profitable production of substantial quantities of wheat with a higher protein content is likely to be associated with an increased use of leguminous pasture leys, as these are likely to increase both grain yield and its nitrogen content. The use of urea sprays has been shown to result in higher protein in the grain. —From author's summary.

6 GREGG, A. S. **Spring wheat variety trials, 1945-1953.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 270-6, bibl. 2.

Trials during 1945-53 of the spring wheats, Atle (control), Atle Elite, Atson, Bersee, Brons, Ella, Fylgia, Karn, Meteor and Progress are reported in detail including tillering and early growth, maturity, diseases, straw-length, lodging and grain yields. Atson was the only variety to outyield Atle consistently. Fylgia was 4-5 days earlier, but lower yielding.—Author's summary.

7 GREGG, A. S. and SHARROCK, J. N. **N.A.A.S./N.I.A.B. trials of spring wheat varieties, 1949-51.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 277-88, bibl. 1.

The varieties of spring-sown wheat on trial were Atle (control), Bersee, Fylgia and Meteor, with Brons included in 8 of the 36 trials. Detailed yield tables are given, and the results were analysed in an attempt to find varietal reactions to season, date of sowing, rainfall and geographical location, altitude, seed rate, soil type and fertility. There were indications that Bersee outyielded Atle in the more south-easterly trial centres with a lower average rainfall, but from the results of all trials they gave similar yields. Fylgia and Meteor were similar with longer straw and lower yields, but earlier maturing, than Atle or Bersee.—From authors' summary.

8 SANDISON, A. **A note on spring wheat variety trials results, 1945-51.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 289-90, bibl. 2.

Results reported in Abs. 6 and 7 are discussed further.—M.P.

9 MINISTRY OF AGRICULTURE NORTHERN IRELAND. **Reports from the Counties. Spring wheat variety trial.** *Mon. Rep. Minist. Agric. N. Ire.* 1955, **30,** No. 5, 148.

The grain yields of the spring wheat varieties Brons, Karn II, Meteor, Fylgia and Atle were 19, 18·75, 18·5, 16 and 12 cwt. per ac., respectively,

and the straw yields were 57·5, 39, 62, 44, and 53 cwt. per ac., respectively. The crop of Meteor lodged badly. Brons and Fylgia ripened 4 days before the other varieties.—M.P.

10 NOULARD, L. Essais sur de nouvelles variétés de froment de printemps. [**Trials with new varieties of spring wheat.**] *Rev. Agric., Brux.* 1955, **8,** No. 8, 1025-8. [Sta. Rech. Etat, Gembloux, Belgium]

In tests for yields and resistance to lodging in spring wheat carried out during 1951-4, Jufy I and Jufy II (of Gembloux) were the best of 16 varieties and showed a very considerable improvement on Fylgia (used for comparison). Seed of Jufy I was multiplied in 1955 and will be available in the spring of 1956.—D.B.

11 ZAHARŽEVSKIĬ, A. [**New variety of hard spring wheat Kubanka 3.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 4, 106-9, illus.

12 BULLEN, E. R. and others. **N.A.A.S./N.I.A.B. trials of winter wheat varieties: 1949-52.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 244-69, bibl. 1.

This report presents information derived from a series of 144 wheat trials carried out on 34 varieties of winter wheat. Observations were made on the field characters of the varieties tested: tables record for each trial the field conditions, the yields of the control and the yields of the other varieties as a percentage of the control. Marked differences in yield were recorded between the main types of wheat. Many varieties show distinct variation in performance due to geographical, seasonal or soil fertility factors.—From authors' summary.

13 ZWEIFEL, J. and KELLER, C. Le froment d'automne Cappelle. [**Cappelle, a winter wheat.**] *Rev. rom. Agric.* 1955, **11,** No. 10, 73-7, illus. [Sta. Féd. Essais Agric., Lausanne, Switzerland]

Cappelle, a French variety of winter wheat, has been under trial in French Switzerland since 1952. Compared with Probus and Mont-Calme 245, Cappelle gives a greater yield of grain and has a greater 1000-grain weight. By virtue of its shorter stem it gives a lower yield of straw and is more resistant to lodging. Cappelle is more resistant than the other two varieties to yellow and brown rusts, but less resistant to black rust and *Erysiphe graminis*. Its inferiority in resistance to these diseases is linked with its lateness in development. Cappelle is less winterhardy than the other two varieties. In quantity of gluten, Cappelle is inferior to Probus and Mont-Calme 245, but in quality of gluten it is equivalent to Probus.—D.B.

14 MALIANI, C. Il nuovissimo frumento "Roberto Forlani". [**The new wheat variety Roberto Forlani.**] *Ital. agric.* 1955, **92,** No. 7, 464-7, illus.

A description is given of the wheat Roberto Forlani which is hardy, medium-early, cold resistant and suitable for hill soils. Its stem is 130-140 cm. high. Its spike, which is large, awned, not branched, was found to contain up to 140 caryopsides. The hectolitre weight of the grain is 76-78 kg. and the weight of 1000 grains is 45-47 g. It gave good results in experimental fields throughout Italy. In the Republic of San Marino, where it was grown this year for the first time on a wide scale, it yielded 3000-4900 kg. of grain per ha.—E.B.O.

15 EKBOTE, R. B. and KAUSHAL, P. K. **Strain 65 is a choice wheat.** *Indian Fmg* 1955, **4,** No. 11, 7, illus. [Wheat Breed. Sta., Powarkheda, Hoshangabad, Madhya Pradesh, India]

Strain 65 is notable for its high production in Madhya Pradesh. It yields well under irrigated and unirrigated conditions.—W.J.B.

16 GREER, E. N. **Milling and baking tests on trial wheats.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 291-6, bibl. 8. [Cereals Res. Sta., Res. Ass. Brit. Flour Millers]

Pilot and N 59 have been found to be 'hard' milling wheats differing in this respect from the remaining trial varieties. For breadmaking, Yga Blondeau, Franc Nord and Cappelle Desprez have been found to be the 'strongest' of the varieties under test, none of which was particularly good.—From author's summary.

17 VARGAS, V. M. La calidad panadera de algunos trigos americanos cultivados en Toledo. [**The baking quality of some American wheats grown at Toledo.**] *Bol. Inst. nac. Invest. agron.* 1955, **15,** No. 32, 73-93, bibl. 8, illus., English summary. [Cent. Cerealicult., Madrid]

The varieties Comanche, Cheyenne, Nebred and Tenmarq, as a result of farinograph experiments and baking tests, were found useful for blending with Spanish varieties. The varieties Wichita, Westar and Pawnee were of excellent baking quality.—G.M.R.

18 GRILLOT, G. Etat actuel des recherches et travaux sur le blé dur au Maroc. [**Present position of research on durum wheat in Morocco.**] *Terre maroc.* 1955, **29,** No. 307, 207-14. [Serv. Rech. Agron., Maroc]

A report is presented on varietal, cultural and manurial trials of irrigated and non-irrigated durum wheat for suitability in different regions of Morocco, and on seed production. Outstanding varieties are

2777 Kyperounda, which is the most productive in the northern half of the country and for most of the irrigated cultures of the south, and the very early variety 3225 Biskri × Bouteille, which is particularly promising under dry-farming conditions.—G.M.R.

19 HÄNSEL, H. Bepaling van de schotresistentie van tarwe door middel van kieming in zand. [**Determination of resistance to sprouting in the ear by germinating the grain in sand.**] *Vijfde CoCoBro-Jaarb., Stichting Coörd. Cult. Onderz. Broodgraan, Wageningen* 1955, pp. 316, bibl. 9, illus., German summary p. 36 [Probdstdorfer Saatzucht, Vienna]

A method of germinating wheat grain on damp sand, to determine resistance to sprouting in the ear, is described. The possibilities of selecting wheat for resistance to sprouting, using the method described, are discussed.—W.J.B.

20 THORPE, H. C. and DUFF, A. D. S. **A note on the appearance of two new stem rust forms in East Africa.** *E. Afr. agric. J.* 1955, **21,** No. 1, 61. [Dep. Agric. Kenya]

Two new forms of *Puccinia graminis tritici*, K13 and K14, were detected during the annual rust survey of East Africa in 1953, and confirmed by tests in 1954. K14 appears to be a virulent form, whereas K13 appears to be less destructive. —M.P.

21 BOCKMAN, H. Vorfruchtwirkung und Schwarzbeinigkeit beim Weizen. [**Black leg and the effect of the preceding crop on wheat.**] *Z. PflKrankh.* 1955, **62,** No. 8/9, 533-9, bibl. 9. [Biol. Bundesanst., Kiel-Kitzeberg, W. Germany]

The connexion between the crop which precedes wheat, the incidence of black leg disease (*Ophiobolus graminis*) and yields of wheat is demonstrated in tables. Crops which are resistant to *O. graminis* are good preceding crops, e.g. oats, peas, clover, rape, lupin, mustard, sugar-beet, potatoes and flax.—D.B.

22 DUFF, A. D. S. **Resistance to take-all disease in Kenya wheat 131. 2. Effect on yield.** *E. Afr. agric. J.* 1955, **21,** No. 1, 32-3, bibl. 2. [Dep. Agric. Kenya]

In trials over 2 seasons in which take-all, *Ophiobolus graminis*, infection was heavy, the yield of the resistant variety 131 was not appreciably reduced by the disease, whereas Kenya Governor, a susceptible wheat, was heavily attacked and suffered a 48·5% reduction in yield. [See also *Fld Crop Abstr.* 8 : 783.]—M.P.

23 GANNON, N. and DECKER, G. C. **Field evaluation of sprays for chinch bug control.** *J. econ. Ent.* 1955, **48,** No. 3, 242-5, bibl. 1. [Illinois Agric. Exp. Sta.]

Good control of chinch bug [*Blissus leucopterus*] on wheat was obtained by Dieldrin applied, by aeroplane, at 0·5 lb. per ac. early in the growing season. Of the insecticides tested as barrier sprays, only Endrin applied at rates of 0·25-0·5 lb. per ac. and Dieldrin at 0·5 lb. per ac. remained effective during the entire periods of migration.—E.B.O.

24 KARLSSON, Birgitta and ELIASSON, L. **The respiratory quotient in different parts of wheat roots in relation to growth.** *Physiol. Plant.* 1955, **8,** No. 3, 561-71, bibl. 22. [Bot. Lab., Univ. Lund, Sweden]

25 RÉDEI, G. and RÉDEI, Györgyné. Adatok a búza szemtermésének fejlödéséhez. **On the development of wheat caryopses.** *Növénytermelés* (*Crop Prod.*) 1955, **4,** No. 2, 133-40, bibl. 10, illus., English summary p. 140. [Inst. Genet., Hungarian Acad. Sci., Budapest]

Experiments with embryo cultures *in vitro* have shown that the free amino acids probably play an eminent role in the nutrition of the embryo. The seeds of a spring variety produced from Bánkuti 1201 winter wheat (var. Erythrospermum) were examined. Only the most fully developed caryopses from the middle third of the ears were used. The fresh- and dry-weight of the caryopses and their nitrogen and phosphorus contents substantially increased when the rate of growth in size was slowing down. Under the conditions of the experiments, on the 12th day after pollination, the highest amount of free amino acids was encountered in the caryopsis. The formol titration value began to decrease as early as the 16th day, calculated for both the dry weight and the individual caryopses. A sigmoid curve characterizes the increase in the number of cells of the embryo. The scutellum showed hardly any growth, either in length or in width, after the 20th day, whereas cell multiplication lasted nearly until ripening. By means of two-dimensional paper chromatography, after extraction with ethanol, 13 ninhydrin positive spots were obtained from four-day-old, 16 from twelve-day-old, and 17 from sixteen-day-old ovaries; sixteen of these spots could be identified for known amino acids. Whereas the free amino acids tended to decline in their total amount with progress in development, the number of individual amino acids was greater on the 16th day than at the time of the previous examinations. —From authors' summary.

26 ATKINS, I. M. and NORRIS, M. J. **The influence of awns on yield and certain morphological characters of wheat.** *Agron. J.* 1955, **47,** No. 5, 218-20, bibl. 4, illus. [Texas Agric. Exp. Sta., College Station]

Isogenic awned and awnless lines of wheat were grown in yield tests during 4 years at Denton, Texas, to investigate the effect of awns on yield and the effect of the number of culms per unit area, kernel size, test weight and number of kernels per head, on differences in grain yields caused by the presence or absence of awns. The 4-year average grain yields of all awned lines were greater than those of the corresponding awnless lines. Differences in favour of the awned lines were significant in two years when soil moisture conditions were such as to limit plant growth ; average differences were 2·1-2·2 bu. per ac. The 1000-grain weight was significantly higher (0·01% level) for the awned lines than the awnless lines in all 4 trial years. Differences between the awned and awnless lines in respect of the other three characters studied were irregular and small in most cases.—P.J.B.

27† BARNARD, C. **Sterile base florets in *Triticum*.** *Aust. J. Bot.* 1955, **3,** No. 2, 149-63, bibl. 6, illus. [Div. Pl. Industr., C.S.I.R.O., Canberra, A.C.T.]

28 MATHON, C. C. Note sui grani a spighe ramificate. [**Notes on wheats with branched ears.**] *Nuovo G. bot. ital.* 1954, **61,** No. 2-3, 345-56, bibl. 21, illus., French summary p. 355. [Mus. Nat. Hist. Naturelle, Paris]

An account is given of investigations on branched wheats of *Triticum turgidum compositum*. These wheats have a photophase of the long-day type. Some of them appear to have a cold thermophase, others a warm, tepid, or indifferent thermophase. —E.B.O.

29 TAMM, E. and SCHENDEL, U. Der Gefässversuch als Mittel zur Feststellung der Standortansprüche von acht Sommerweizen- und acht Hafersorten an die Wasser- und Nährstoffversorgung. [**The pot experiment as a means of determining the habitat requirements of eight spring-wheat varieties and eight oat varieties as regards supply of water and nutrients.**] *Z. Acker- u. Pflbau* 1955, **99,** No. 4, 427-62, bibl. 16, illus. [Inst. Acker- u. Pflbau, Techn. Univ., Berlin]

The yield of grain and straw of the 16 cereal varieties is reported when each was grown in a loose humus soil and subjected to changes in 2 habitat factors : water (at 2 levels) and nutrients (at 3 levels). There was a marked difference in the reaction of the different varieties but a statistical study of the results showed that genetic constitution had a greater influence than habitat in determining productivity.—D.B.

30 RAI, G. S. and HAMNER, C. L. **Effect of sodium trichloroacetate on the intake of nutrients by wheat plants grown in Oshtemo sand at low and high fertility levels.** *Weeds* 1954, **3,** No. 3, 254-6, bibl. 5. [Hort. Dep., Michigan State Coll., East Lansing]

Wheat seedlings grown in pots in soil containing 15 or 30 lb. TCA per ac. were stunted and eventually died. This appeared to be the result of metabolic changes, accompanied by unbalanced nutrient uptake.—From authors' summary.

31 GARDNER, H. W. **Foliar application of nitrogen to winter wheat.** *Agriculture, Lond.* 1955, **62,** No. 6, 267-9, bibl. 1. [Hertford Inst. Agric., St. Albans]

Preliminary results of trials in Hertfordshire suggest that there are no advantages, either in terms of dry weight or crude protein, to be gained by applying N to winter wheat as a urea spray, instead of as a solid top dressing.—Author's summary.

32 ALMEYDA, E. L. Comparación de diversos abonos fosfatados en trigo y su effecto residual en la empastada. [**Comparison of the effects of various phosphatic fertilizers on wheat and of their residual effect on pastures.**] *Agric. Téc., Santiago* 1954, **14,** No. 1, 17-26, bibl. 1, English summary p. 26.

BUCKWHEAT

33 TROYER, J. R. **The distribution of rutin and other flavonoid substances in buckwheat seedlings.** *Pl. Physiol.* 1955, **30,** No. 2, 168-73, bibl. 28, illus. [Columbia Univ., New York]

Five flavonoid substances have been found to occur in both green and etiolated buckwheat seedlings ; their distribution in roots, hypocotyls, cotyledons, and pericarps is described. Only small quantities of the substances have been separated, but these have been sufficient for determination of Rf values in a number of solvents, performance of colour tests, and measurement of ultra-violet absorption under various conditions. One of the five substances was shown by comparison with an authentic sample to be rutin ; it is the only one found in the ungerminated seed, as well as the only one present in all parts of developing seedlings. Properties of the other four substances suggest that all are flavones or flavonols. Free quercetin was not detected in seeds or seedlings.—Author's summary.

OATS

34 DANIEL, G. H. **Dredge corn trials 1946-51.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 309-17, bibl. 8.

Eagle oats and Camton barley were grown as pure crops of each and as mixtures. Results indicate that, under favourable growing conditions, the mixture will give slightly higher yields than either crop grown alone. A mixture of equal amounts of oats and barley (by weight) appears satisfactory.—M.P.

35† HENDERSON, J. L. and DAVIES, R. O. **The yield and composition of mixed cereal-legume crops at different stages of growth. Part 1.** *Emp. J. exp. Agric.* 1955, **23,** No. 9, 131-44, bibl. 7, illus. [Univ. Coll. Wales, Aberystwyth]

The productivity, at seven stages of growth, of oats, peas and field beans grown singly, and all together in an oat/legume mixture, were compared during 3 years. The oat/legume mixture gave a higher dry-matter yield than any of the crops grown singly, while the peas yielded the greatest amount of crude protein. During the curing and harvesting of the crops for grain production, shedding and handling losses seriously reduced the dry-matter and crude-protein yields. Because of these losses the animal nutrients available in the grain and straw were less than those from the green material when cut at a stage of growth suitable for ensilage.—From authors' summary.

36 JUSTUS, N. and THURMAN, R. L. **The effect of clipping and grazing on the subsequent growth of winter oats.** *Agron. J.* 1955, **47,** No. 2, 82-3, bibl. 3. [Univ. Arkansas, Fayetteville]

37 BELL, R. A. M. and PRICE, C. D. **N.A.A.S./N.I.A.B. trials of winter oats varieties, 1949-51.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 297-302, bibl. 1.

The details of 15 trials are reported. The control variety, S.147, was superior to Picton, which in turn was superior to Grey Winter. S.172 was inferior to all in average yield of grain, but showed a valuable resistance to lodging.—From authors' summary.

38 MINISTRY OF AGRICULTURE NORTHERN IRELAND. **Reports from the counties. Oat variety trials.** *Mon. Rep. Minist. Agric. N. Ire.* 1955, **30,** No. 6, 170-2.

In low-land plot trials, the oat variety Forward, yielded at the rate of 23·75 cwt. of grain and 35 cwt. of straw per ac. and maintained its superiority over Svalof Blenda, Steel (Sun II) and Ayr Line. Of the new introductions, Marne showed promise, but Albyn Donside produced a low yield of inferior grain and straw of poor quality. In high-land trials, Utility outyielded Stormont Kern and Stormont Grandee in both grain and straw. Bell was again the lowest yielder.—M.P.

39† RYAN, F. E. **Spring sown oats for hay. Variety trial Denmark Research Station, 1954.** *J. Dep. Agric. W. Aust.* 1955, **4,** No. 4, 463.

Of the 6 early and mid-season oat varieties sown early in spring, Fulghum, W.32 and Avon (W.29) yielded 46, 44 and 43 cwt. of hay per ac., respectively, as against the 28, 25 and 24 cwt. of hay per ac. yielded by Ballidu, Wongan and Orient. When spring-sown, only 7 days separated Wongan, the earliest to mature, and Orient and Avon, the latest to mature.—M.P.

40 BERGSTRÖM, C. Förädling av tidig svarthavre—några resultat från Sveriges Utsädesförenings Övre-Norrlandsfilial. [**Breeding of early black-hulled oats—some results from the Upper Norrland Branch of the Swedish Seed Association.**] *Sverig. Utsädesfören. Tidskr.* 1954, **64,** No. 3, 198-205, bibl. 9, English summary pp. 203-5.

Notes are given on oat breeding at the Upper Norrland Branch Station of the Swedish Seed Association. Named varieties so far produced have included : Orion I, Orion C, Orion II and Same. Orion II was an improvement on Orion I and Orion C and was grown for a long period in Upper Norrland. In the 4 northernmost counties of Norrland, Same has given yields 10% above those of Orion II, is more stiff-strawed, ripens about 1 day earlier and has similar grain quality. In southern Norrland conditions, Orion III has given good results. In an attempt to improve Same oats, an improved line is to be released soon. Another promising selection is a cross (Mesdag × Orion II) × Sirius I (L.01321), which has surpassed Same in yield and straw-stiffness.—P.J.B.

41 DANJO, T. **On the consumption of the stored foods in the seeds during germination of cereals. 8. Expansion of epithelium tissue of scutellum in oat seed.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 242, English summary. [Fac. Agric., Univ. Miyazaki]

During germination, the scutellum was found to grow to the top of the grain, a phenomenon characteristic of the oat plant. The epithelium of the scutellum enlarged in area as the scutellum expanded. The absorption by the scutellum of food materials in the grain may, therefore, be more vigorous in oats than in other cereals.—From author's summary.

42 ANDERSON, D. M. W. and GREENWOOD, C. T. **An investigation of the polysaccharide content of oats, *Avena sativa* L.** *J. Sci. Fd Agric.* 1955, **6,** No. 10, 587-92, bibl. 24, illus. [Dep. Chem., Univ. Edinburgh]

43 WIGGANS, S. C. and FREY, K. J. **The effect**

of increased daylengths on the production of greenhouse grown oats. *Agron. J.* 1955, **47,** No. 8, 387, bibl. 1. [Agron. Dep., Iowa State Coll., Ames]

Greenhouse experiments were carried out to determine the optimum conditions of temperature and photoperiod for producing oat plants in the shortest possible time. Five oat varieties : Bond, Clintland, Mo 0-205, Simcoe and Victorgrain, classed respectively as early mid-season, mid-season, late and very late in maturing when grown as spring varieties, were grown in 4 in. pots (3 plants per pot), at temperatures of 58°F. and 70°F., under the following photoperiodic conditions : (a) 9 hr. daylength, (b) 9 hr. + 1 hr. at midnight, (c) 15 hr., (d) 18 hr. and (e) 24 hr. daylength. Oats grown at 58°F. required about 8 days longer from sowing to heading than where 70°F. was used, for given photoperiods. The shortest period from sowing to heading occurred under 18 and 24 hr. photoperiods in all varieties. Allowing 30 days from heading to seed maturation, a generation of Bond, Clintland, or Mo 0-205 could be completed in 75-80 days ; in the case of the very late variety Victorgrain, a generation could be produced in 85 days.—P.J.B.

44 MATSUBAYASHI, M. and others. **Studies of water economy in crop plants. I. The relation between temperature and water economy in oats and upland rice.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 239-40, English summary. [Tohoku Nat. Agric. Exp. Sta.]

The influences of night temperature on the water economy of oats adapted to a cool climate and upland rice adapted to a hot climate were observed. Cool night air temperature was favourable to growth and yield in the oats, but heading was somewhat retarded. It was unfavourable for growth but favourable for ripening in upland rice, and it is possible that wide diurnal ranges of air temperature promoted crop ripening. In the oat plant, transpiration per day was greatest from the beginning of heading to the early stage of maturity, and in upland rice at the heading stage. In oats, through almost every growth stage, water requirements were lower in cool, than in warm, nights, while in upland rice they were higher in cool nights during the vegetative growth stages, and lower after heading.—From authors' summary.

45 GRAFIUS, J. E. and others. **Stem-break in senescence in oats.** *Agron. J.* 1955, **47,** No. 9, 413-14, bibl. 2. [Michigan Agric. Exp. Sta., East Lansing]

Some of the factors concerned in stem-break in senescence in oats were investigated and a study was made to determine whether varieties resistant to lodging, as measured by the cL_r factor (see Abs. 406) were also resistant to stem-break. Three factors were found to be associated with percentage stem-break. These were : lodging resistance readings made in the early dough stage, maturity as measured by date of heading, and the incidence of *Septoria avenae*. The correlations between stem-break percentages and the first two factors were highly significant and of approximately the same magnitude. The correlation between stem-break and *Septoria avenae* readings was significant in one case.—P.J.B.

46 SAALBACH, E. Über die Ursachen der Förderung des Sprosswachstums von Hafer durch Polyoxyanthrachinone. [**Causes of the growth-promoting action of polyoxyanthraquinone on the shoot of oats.**] *Z. PflErnähr. Düng.* 1955, **69,** No. 1-3, 246-55, bibl. 25. [Forschungsanst. Landw., Braunschweig-Völkenrode, W. Germany]

Polyoxyanthraquinone has a growth-promoting effect on oats only when N is supplied as nitrate, which this agent reduces. The reaction takes place in the presence of light.—D.B.

RYE

47† MACHT, D. Sommer-Roggen als Zwischenfrucht. [**Spring rye as a catch crop.**] *Dtsch. landw. Pr.* 1955, **78,** No. 15, 217.

Although spring rye provides valuable green fodder in autumn at a time when this is scarce, it has been little used as a summer catch crop. As a fodder it is more palatable than mustard or rape which are the more usual summer catch crops. If sown in mid-August, the rate is 200 kg./ha., but if in late August, the rate is 240 kg./ha. In addition to manuring to supply the ordinary soil requirements, 2-3 dz. nitrochalk should also be applied. The crop grows very rapidly and is ready for cutting in 7-8 weeks' time. Average yields are 150 dz./ha. Staggered sowing at 5-day intervals provides young protein-rich fodder over a period. [1 dz. = 100 kg.]—D.B.

48 BELL, R. A. M. and PRICE, C. D. **N.A.A.S./N.I.A.B. trials of winter rye varieties, 1948-1951.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 303-8, bibl. 1.

The trials confirmed the greater yield potential of Pearl and Petkus—the newer, shorter-strawed types of winter rye. Their resistance to lodging was a distinct improvement on the native English stocks.—M.P.

49 WAGNER, F. Versuche zur Bekämpfung des Schneeschimmels (*Fusarium nivale* Ces.) bei Winterroggen in Höhenlagen mit Stäube- und Spritzmitteln im Spätherbst. [**Trials on the control of snow mould (*Fusarium nivale*) in winter rye at high altitudes with powders and sprays in late autumn.**] *Z. PflKrankh.* 1955, **62,** No. 8/9, 539-44, bibl.

14, illus. [Bayer. Landesanst. Pflbau u. Pflschutz, Assenstelle Bayreuth, W. Germany]

At high altitudes, where snow lies for long periods, seed treatment with mercury-containing compounds is inadequate to prevent attack by *F. nivale*. In the case of rye, preparations containing pentachlornitrobenzene were successful when applied in late autumn, i.e. before the fall of long-lying snow. 50 kg./ha. of active substance when applied as powder and 20 kg./ha. when applied as spray, are recommended for giving good protection over a period of 83 days of snow cover. —D.B.

BARLEY

50 MORRIS, G. P. **Descriptions of barley varieties.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 318-19, bibl. 4.

The varieties described are Maythorpe and Provost.—M.P.

51 MINISTRY OF AGRICULTURE NORTHERN IRELAND. **Reports from the counties. Barley variety trials.** *Mon. Rep.Minist. Agric. N. Ire.* 1955, **30,** No. 6, 172.

In plot trials conducted at 9 centres in 1954 with 6 varieties of barley, Bonus, Proctor and Freja were top yielders with 25, 23·5 and 22·5 cwt. of grain per ac. In trials during 5 seasons, Freja has yielded an average of 25·2 cwt. of grain per ac.—M.P.

52 STRAND, E. Resultater av sortforsøk med bygg på sør-Østlandet 1940-51. **Results of variety trials with spring barley in south-eastern Norway 1940-51.** *Forskn. Fors. Landbr.* 1953, **4,** No. 4, 287-318, bibl. 39, English summary pp. 314-15. [Fm Crop Inst., Roy. Agric. Coll. Norway, Vollebekk]

The trials reported were carried out with 49 varieties of 2-rowed and 6-rowed barley. Brief accounts are given of the origins of each variety and of their mutual relationships. In all trials with 6-rowed barleys, Asplund gave the highest mean grain yield of 316 kg. grain per decare (0·1 ha.) with 406 kg. straw per decare. Verde and Herse gave mean grain yields 20 kg. per decare lower than those of Asplund. Among 2-rowed varieties, Ymer gave the highest mean yield of 338 kg. grain per decare, followed by Herta with 329 kg., Opal B 325 kg. and Maja with 320 kg. per decare. Ymer had moderate straw strength and resistance to weathering, while Herta was very stiff-strawed and resistant to weathering. Data are given of lodging percentages, days to shooting and maturation, straw length, 1000-grain weight and yields of grain and straw for 6-rowed barleys grown at Vollebekk. Data are also given of heat-sum requirements from sowing to maturation for 2-rowed and 6-rowed varieties at Vollebekk. All varieties gave their highest yields following a cool spring; this was more obvious in 2-rowed than 6-rowed varieties. Two-rowed varieties responded better to warm conditions in late summer than did 6-rowed varieties. Herta appeared to have the highest warmth requirement and Domen the lowest. Two-rowed varieties utilized larger amounts of rainfall in both early and late spring than did 6-rowed varieties. Domen, and, to a lesser extent, Herta, were able to utilize large amounts of rainfall. In cool summers, 6-rowed varieties gave relatively better results than 2-rowed varieties. Where summer temperatures during May-August fell below the mean for 1874-1939, Asplund 6-rowed barley equalled the yield of the best 2-rowed variety. Mean temperatures during this period at Vollebekk for May, June, July and August were 9·6, 14·2, 16·2 and 14·6°C., respectively. Varietal recommendations are given for different regions of south-eastern Norway.—P.J.B.

53 ÅSANDER, F. Förädling av tidigt sexradskorn för Norrland. [**Breeding of early six-rowed barley for Norrland.**] *Sverig. Utsädesfören. Tidskr.* 1954, **64,** No. 3, 191-7, illus., English summary pp. 195-7.

Observations are made on early-maturing, 6-rowed barley varieties bred by the Swedish Seed Association for conditions in north Sweden (Lat. 61-69°N). For Jämtland conditions, on relatively fertile, calcareous soils, Svalöf's Dore (marketed 1933) has been grown for many years. This variety is early, stiff-strawed and gives good yields, but is limited in adaptation as a result of its high lime requirement. Subsequent work at the Jämtland Branch Station resulted in the breeding of Svalöf's Edda I, Edda II and Åsa. Edda I has outyielded Vega by about 10% in the 4 northern-most provinces of Norrland and by an even greater margin in Jämtland. Svalöf's Edda II has a better grain quality than Edda I and ripens better, but has a relatively smaller area of adaptation than Edda II. In south Norrland, Edda I has outyielded Edda II. Svalöf's Åsa is very early-maturing and is intended for areas where the demand for early maturity is such as to preclude the use of Edda I and II. Breeding work is in progress at the Västernorrland Branch Station to produce early-maturing, 2-rowed varieties for combine harvest in Norrland conditions. —P.J.B.

54 ARNY, D. C. and LEBEN, C. **The effect of water-soak seed treatment on the germination of certain barley varieties grown at different locations.** *Phytopathology* 1955, **45,** No. 9, 518-19, bibl. 8. [Wisconsin Agric. Exp. Sta., Madison]

Studies were made on the effect on germination of

water-soak treatments (soaking for 56 hr. at 22-25°C.) made to the seed of several barley varieties grown in 1953 at 16 locations in the Upper Mississippi Valley. Varieties used included: Kindred, Manchuria, Montcalm, Moore, Wisconsin Barbless and Mars. Soaking treatments were very detrimental to the germination of Kindred, but had almost no effect on Wisconsin Barbless. Other varieties were intermediate in their response. There was evidence of considerable differences in response between seed of the same variety which originated from different locations. In some cases, the reduction of germination was serious and it was concluded that soaked seed should be tested for germination before sowing.—P.J.B.

55 HORBER, E. Unterschiede in der Anfälligkeit verschiedener Wintergerstensorten gegenüber der Sommergeneration der Fritfliege. [**Differences in susceptibility of several varieties of winter barley to the summer generation of the frit fly.**] *Mitt. schweiz. Landw.* 1955, **3,** No. 8, 113-18, bibl. 2, illus. [Eidg. Landw. Versuchsanst., Zürich-Oerlikon, Switzerland]

Experiments have shown that varieties of *Hordeum vulgare* which are only slightly susceptible to attack by the summer generation of frit fly [*Oscinis frit*] are: Gembloux 456 (Bordia), Firlbeck I and Engelen (Dea).—D.B.

56 EUROPEAN BREWERY CONVENTION. **Report of the Barley Committee. Trials 1953.** Rotterdam, 1955, 1-95.

Trials with malting varieties of barley in Austria, Belgium, Denmark, England, Finland, France, Germany (Bavaria), Germany (Rheinhessen), Netherlands, Ireland, Norway, Sweden and Switzerland are described. The results in each country showing, for each variety, grain yields, dry-matter yields, chemical composition of the grain, and germination and malt-analysis of harvested grain, are tabulated. Kenia (standard variety), Carlsberg II, Haisa and Herta were sown in the trial in all countries, and Bonus, Piroline and Proctor in most countries. Other varieties were sown in a few countries only. Carlsberg II gave consistently higher yields than other varieties, closely followed in some countries by Haisa and Herta. In Germany (Rheinhessen), Haisa outyielded Carlsberg II by nearly 20%. The average yield of Kenia and Piroline was significantly lower than that of the other varieties. Piroline was generally the earliest, and Proctor the latest variety to ripen. Carlsberg II showed the highest average N content, closely followed by Bonus and Proctor. Proctor gave the highest malt-extract yield in all countries.—W.J.B.

MAIZE

57 SELLSCHOG, J. and STEAD, B. **Production of maize [in S. Africa].** *Fmg in S. Afr.* 1955, **30,** No. 353, 369-76, illus.

Practical details and recommendations for cultivation of maize are outlined. Consideration is also given to the use and value of rotation crops such as cowpeas, groundnuts, soyabeans and sunflowers. The distribution and characteristics of maize varieties and hybrids are tabulated.—M.P.

58 MATHIEU-REVERDY, G. Productivité du maïs à Dijon. [**The productivity of maize in Dijon.**] *C.R. Acad. Agric. Fr.* 1955, **41,** No. 10, 461-3, bibl. 10. [Inst. Nat. Rech. Agron., Sta. Agron., Dijon]

In trials in 1953, the grain yields from W 255 maize sown at a rate equivalent to 50,000 plants per ha., were 10,460 kg. under irrigation and 7440 kg. per ha. without irrigation, and the total dry-matter yields were 15,090 kg. and 11,790 kg. per ha., respectively. The production of about 15,000 kg. dry-matter is considered to be a maximum under the climatic conditions prevailing at Dijon. The application of 200 kg. N per ha. was shown to be justified since 211 kg. N per ha. were removed by harvesting the irrigated crop, and 152 kg. N per ha. by the non-irrigated crop. The quantities of K_2O and P_2O_5 removed with the crop were far less than the amount supplied in the fertilizers.—M.P.

59 ANGULO, B. M. La densidad de plantación y el abonado en el hibrido US-13. [**Plant density and manuring of the maize hybrid US-13.**] *An. Esta. exp. Aula Dei* 1954, **3,** No. 2, 261-5, English summary p. 265.

A trial was carried out in 1952 to determine the optimum plant density and amount of N fertilizer for the hybrid US-13 grown under irrigation in Aragon. From data of grain yields, stalk weights and percentage of plants broken under the ear node, it was concluded that the optimum density is 4 plants per sq. m. and the optimum amount of N fertilizer 750 kg. of sodium nitrate per ha.—E.B.O.

60 BATES, R. P. **Climatic factors and corn yields in Texas Blacklands.** *Agron. J.* 1955, **47,** No. 8, 367-9, bibl. 7. [Texas Agric. Exp. Sta., Substa. No. 5, Temple]

The climatic factors considered included rainfall during several periods of each year, and the following factors during June: mean maximum temperatures, number of times rain fell, mean relative humidity, evaporation, number of cloudy days and number of hot winds. Most of the maize grown in the Texas Blacklands is pollinated in June. The climatic data used were taken from records made during 1913-53 and mean yields of the 10 top-yielding varieties tested during this period were used. Mean yields during the 41-year test period ranged from 4·2-57·4 bu. per ac. All climatic factors studied, except the number of hot

winds, were significantly correlated with yields. Among single factors, the mean maximum June temperatures showed the closest correlation with yields. Mean relative humidity and evaporation in June also showed a close correlation. These three factors were closely associated one with another. The number of rains in June showed a higher degree of correlation with yields than any other rainfall factor studied. Rainfall in June had a greater effect on yields than rainfall at any other period during the growing season.—P.J.B.

61† Šapovalov, P. T. [**Extending the area of maize and Sudan grass sowings in fodder-crop rotations.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 4, 68-70. [All-Union Sci. Res. Inst. Sugar-Beet]

The work is concerned with the collective and State farms in the forest/steppe area of beet production in the Ukraine and Central Chernozem belt, where natural pasture is extremely limited.—M.H.

62 Karulis, Ja. Ja. [**Experiment on growing maize on collective farms of the Latvian SSR.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 4, 65-7.

63 Portères, R. L'introduction du mais en Afrique. [**The introduction of maize into Africa.**] *J. Agric. trop. et Bot. appl.* 1955, **2,** No. 5-6, 221-31, bibl. 8.

Maize was introduced into Africa in the 16th century by 2 different routes. The hard-seeded types were introduced from America via the Mediterranean and the Nile into the northern and eastern regions, and the Lake Chad region. The soft-seeded types were introduced via the Guinea Coast.—From author's summary.

64† Kavanagh, L. R. **Maize—1955-56 sowing recommendations.** *Agric. Gaz. N.S.W.* 1955, **66,** No. 6, 282-6, illus.

Hybrid maize varieties are recommended, according to their maturity group and their use for grain, green fodder and silage, for the different districts of New South Wales. Descriptions of the hybrids are given. New South Wales Government certified hybrid seed is available for the first time.—M.P.

65 Brandolini, A. Contributo allo studio delle varietà italiane di mais. Il granoturco "Rostrato" (*Zea mays* L. cv. "Rostrata"). Parti 1, 2 e 3. [**A contribution to the study of Italian maize varieties. Rostrato (*Zea mays* cv. *rostrata*). Parts 1, 2 and 3.**] *Suppl. Ann. Sper. agr.* 1955, **9,** No. 2, 3 and 4, 71-95, 149-69 and 103-18, bibl. 35, illus., English summary pp. 95, 169 and 117. [Sta. Sper. Maiscolt., Bergamo, Italy]

This paper won first prize in a competition for original works on maize held under the auspices of the Italian Ministry of Agriculture and Forestry. The maize variety *rostrata* consists of many biotypes which present great variability of character. A common varietal character is the "rostrum". This is a conical point situated on the corona and directed towards the tip of the ear. The colour of the grain is mainly orange-red. This variety is grown in scattered areas in northern Italy where it is known by several local names. Its area of cultivation is decreasing. This paper gives information on Rostrato, including its description, botanical classification, origin and variability; and a study of the effect of different cultural and climatic conditions on its biometric characteristics, productivity and biological cycle with a view to employing it in breeding hybrids.—E.B.O.

66† Musiĭko, A. S. [**The breeding of the new maize variety Odesskaja 10.**] [Russian] *Izv. Akad. Nauk SSSR Ser. Biol.* (*Bull. Acad. Sci. USSR*) 1955, No. 5, 57-62, illus. [All-Union Select. Inst. im. T.D. Lysenko, Odessa]

The yields of grain and of green matter for silage obtained from this variety of *Zea mays* when grown in various regions of USSR are recorded, and comparison is made with yields obtained from other maize varieties.—M.H.

67 Galeev, G. S. [**Hybrid maize VIR.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 5, 22-30.

68 Secretaria de Agricultura y Ganaderia, Mexico. Maíz híbrido para el Bajío y regiones similares. [**Hybrid maize for the Bajío and similar regions.**] *Foll. Divulg. 19. Sec. Agric. Ganad., Mex.* 1955, pp. 35, bibl. in text, illus., English summary.

Three hybrids have been developed which meet the special requirements of the Bajío, namely, Rocamex H-309, Rocamex H-230, and Rocamex H-220. —G.M.R.

69 Hoppe, P. E. and Wright, A. H. **How well is corn seed-treated in commercial practice?** *Agron. J.* 1955, **47,** No. 8, 383-6, illus. [Wisconsin Agric. Exp. Sta., Madison]

The tests reported were carried out on maize seed samples collected by the Wisconsin Seed Certification Service for certification in 1952 and '53, most of which were new seed from the 1951 harvest and some of which were carry-over lots from the 1951, '50 and '49 harvests. The seed was cold-tested by the rolled paper-towel technique. The tests were designed to show whether standard seed treatment with Arasan in the laboratory produced any increase in the germination of seed already treated (mostly with Arasan) by the grower. The

results demonstrated the efficiency of the paper-towel method for cold-testing maize seed. There was evidence for poor germination under cold-test conditions in the case of old seed lots, which was not apparent when standard room-temperature tests were carried out.—P.J.B.

70 JACKS, H. and GRAHAM, G. J. **Seed disinfection. 11. Control of head smut (*Sorosporium reilianum* (Kuhn) McAlpine) of maize.** *N.Z. J. Sci. Technol. Sect. A* 1955, **37,** No. 2, 141-5, bibl. 2. [Pl. Dis. Div., Dep. Sci. Industr. Res., Auckland (H.J.) and Dep. Agric., Gisborne (G.J.G.)]

Where crop rotation cannot be practised, seed treatment is an inexpensive way of diminishing losses due to head smut, as the amount of chemical used is very small in relation to the quantity of seed (0·2% or 0·4% of seed weight). The lowering of disease incidence in the field indicates that seed treatment of maize with organic mercury (Agrosan), Thiram (Thirodust), or Dichlone (Phygon XL), can be recommended.—Authors' conclusions.

71 BLANCHARD, F. A. **Uptake, distribution, and metabolism of carbon-14 labeled trichloroacetate in corn and pea plants.** *Weeds* 1954, **3,** No. 3, 274-8, bibl. 13. [Dow Chem. Co., Midland, Michigan]

Maize and pea plants were grown in nutrient solutions containing 34 ppm. NaC^{14}-TCA, to approximate a field treatment of 11 lb. TCA per ac. with a 3 in. penetration of the herbicide into soil with a 50% moisture content. The plants were harvested after 3 or 15 days growth in the TCA solutions. Foliar applications of TCA were also made to maize plants. TCA, only, with no metabolic breakdown products, was found in the plants. The tops and roots of maize plants contained 70-75% as much TCA as did the pea plants, where the plants were treated 3 days before harvest. The shoot apices of the maize plants contained only 30% as much TCA as did the shoot apices of the pea plants.—P.J.B.

72 GIFFARD, E. G. **A note on the uptake of minerals by maize when topdressed with three levels of nitrogen.** *Rhod. agric. J.* 1955, **52,** No. 3, 262-7, bibl. 2.

The effect of 0, 300 lb. and 600 lb. nitrate of soda per ac. on the protein and mineral content of the grain of the maize varieties 50 H 35 (hybrid) and Hickory King was studied. From 2 seasons' results there appeared to be a tendency for maize to take up certain nutrients, apart from N, in greater quantities when topdressed fairly heavily with N. 50 H 35 outyielded Hickory King at all levels of nitrogen, and at the highest N level had the highest protein content.—M.P.

73 CENTRO DE INVESTIGACIONES AGRONÓMICAS, VENEZUELA. Mecanización del cultivo del maíz. [**Mechanization of maize growing.**] *Agricultor venezol.* 1955, **19,** No. 176, 14-19, illus.

Until now, heavy weed growth in Venezuelan maize cultures has necessitated costly harvesting by hand. The Centre of Agronomic Research describes a new sowing system which enables mechanical harvesters to be used. Instead of sowing in the usual 1-metre drills, a series of 2 rows 0·40 m. apart is drilled with a space of 1·60 m. intervening between each set of 2 rows. The number of plants per hectare is the same as if 1 m. drills were used. The 1·60 m. lanes are employed for the passage of a disc harrow to control weed growth in the lanes themselves and of a sprayer to control weeds in the drills. The only weeds extant at harvesting are grasses, which, appearing at the time when the maize is mature, are not sufficiently developed to impede the course of the mechanical harvester.—G.M.R.

MILLETS AND SORGHUM

74 NARAYANASWAMI, S. **The structure and development of the caryopsis in some Indian millets. 3. *Panicum miliare* Lamk. and *P. miliaceum* Linn.** *Lloydia* 1955, **18,** No. 2, 61-73, bibl. 16, illus. [Univ. Michigan, Ann Arbor]

75 MIYAJI, Y. and SAMURA, T. **Influence of air humidity on the modes of blooming and pollination in Italian millet (*Setaria italica* Beauv.).** [Japanese] *Bull. Fac. Agric., Kagoshima* 1954, No. 3, 1-6, bibl. 4, English summary.

Under very dry (humidity 35-50%), moderately dry (humidity 50-68%), and moist conditions (humidity 90-100%), flowering in *Setaria italica* was observed and classified as follows : (1) glumes slightly opened ; (2) glumes widely opened but filaments not stretched at all ; (3) glumes fully opened and filaments stretched out ; (4) glumes beginning to close, filaments drooping and anthers hanging down. Results are tabulated and summarized, and it is concluded that adequate moisture is necessary for obtaining pollen grains in the artificial hybridization of Italian millet.—G.M.R.

76† RYAN, F. E. **Sorghum for grain and fodder in the south-west [of Western Australia].** *J. Dep. Agric. W. Aust.* 1955, **4,** No. 4, 465-71, illus.

The fodder sorghums, Saccaline and Italian, have proved very satisfactory in demonstrations ; they produce a large bulk of palatable green forage and can make considerable regrowth after cutting.

Ploughing and fallowing of the soil in early spring, when adequate moisture is available, is important for the success of these summer fodders. The use of grain sorghums, such as Early Kalo, Alpha and Hegari, as a crop in dairy areas, is limited by the lack of harvesting machinery. The mature standing crop is a valuable source of grain and forage for feeding to pigs and cattle in the autumn. Yields of 50 bu. of grain per ac. have been recorded in some demonstrations.—M.P.

RICE

77 RANATUNGA, A. S. and others. **A brief survey of rice production in Japan.** *Trop. Agriculturist* 1954, **110,** No. 4, 246-59, illus.

The authors, who spent 6 months on a study tour in Japan, give a comprehensive account of the methods of rice production in that country, and draw some comparisons with conditions in Ceylon. —M.P.

78 MATA, J. P. Generalidades del cultivo del arroz en Costa Rica. [**Generalities on rice cultivation in Costa Rica.**] *Suelo tico* 1955, **8,** No. 32, 30-3.

79 UEKI, K. and TERAYAMA, Y. **On the influence of temperature of irrigating water upon the growth of paddy rice in the warmer district. I. The effect of colder temperature of irrigating water at the different stages of the growing period.** [Japanese] *Bull. Fac. Agric., Kagoshima* 1954, No. 3, 7-13, bibl. 9, English summary.

Comparison was made, in 1952 and 1953, of rice plants grown in pots and kept in standing water (maximum temperature 29°-35°C., minimum about 26°C.) with others transferred at different stages of growth to running water (maximum temperature from 9 a.m. to 5 p.m. 25°C.-29°C., minimum about 22°C.). When the plants were subjected to the colder conditions at the spike-differentiating period, the withering of the lower leaves was delayed and the length of stem and spike, the number of grains per spike and the weight of grains per pot were significantly greater than in those cultivated under the warmer irrigation water throughout the growing season. Neither during tillering nor after the heading period were growth or yield unfavourably affected by the colder irrigation water.—From authors' summary.

80 PROVAGLIO, G. La distruzione del "giavone" con la concimazione. [**Control of *Panicum* spp. by manuring.**] *Riso* 1955, **4,** No. 9, 8-12, illus., English and French summaries p. 12.

Results from 11 trials carried out in rice fields on fertile or poor soils in Vercelli Province, Italy, showed that weeds of *Panicum* spp. are controlled by manuring with calcium cyanamide. This method can be applied only to soils which require N. The procedure is as follows. About 10 days before sowing, the soil is flooded for 2 days to stimulate the germination of *Panicum* seeds. The water is then drained off but the soil kept moist. The calcium cyanamide is applied when the *Panicum* spp. have 2 leaves. The minimum dose tested, 200 kg. per ha., is sufficient. Three days later the field is flooded again and the rice is sown. Calcium cyanamide was also found to be effective against *Potamogeton* sp., *Alopecurus geniculatus* and *Alisma plantago.*—E.B.O.

81 VASCONCELLOS de C. e J. Plantas vasculares infestantes dos arrozais. [**Vascular plants infesting rice-fields.**] *Publ. Minist. Econ. Comm. reg. Comércio Arroz, Lisboa* 1954, pp. 188, bibl. 59, illus., English summary p. 179.

General information is given on weed control in rice fields. Botanical description, geographical distribution, synonymy, propagation and control measures are then given for each of the principal weeds of Portuguese rice fields. There is an index of scientific and popular names.—E.B.O.

82 DIRVEN, J. G. P. and JONGE POERINK, H. J. **Weeds in rice and their control in Suriname.** *Trop. Agric. Trin.* 1955, **32,** No. 2, 115-23, bibl. 7, illus. [Agric. Exp. Sta., Paramaribo, Dutch Guiana]

The control of weeds on the mechanized rice farms of Suriname (Dutch Guiana) is described. The mechanization of rice-growing (with direct sowing replacing transplanting) has led to an increase in weed numbers. The farms are on heavy clay. The chief weeds are grasses, Cyperaceae and various other weeds, including aquatic weeds and many woody shrubs. Among the grasses, *Ischaemum rugosum* is the most dangerous weed and *Echinochloa colonum, E. crus-pavonis* and *Leptochloa scabra* are very common. Of the Cyperaceous weed group, *Fimbristylis miliacea* is the most wide-spread. The following 3 methods of control are discussed : (1) prevention of the invasion of the areas by weed seed from elsewhere ; (2) cultivation measures ; (3) chemical control. Planting of the embankments with Bermuda grass (*Cynodon dactylon*) keeps the embankments weed-free. The use of clean implements and pure seed are also recommended for keeping weed invasion in check. Shallow cultivation after harvest, followed by deeper ploughing after weed seeds have germinated (a special irrigation will assist germination), is recommended for the control of *F. miliacea* and other weeds. Sowing rice in a layer of water about 10-15 cm. deep (introducing the water just before or just after sowing) is

useful for controlling *Echinochloa* spp., *I. rugosum*, *L. scabra* and *F. miliacea*. Tests were carried out in irrigated rice-fields with the following chemical weedkillers: DNOC, DNBP, PCP, sodium arsenite, 2,4,5-T, 2,4-D, MCPA and brushkiller (mixture of 2,4-D and 2,4,5-T). The last 3 weedkillers mentioned were the most effective ; among the weeds controlled by them were *Canna glauca*, *Jussieua* spp., floating aquatic plants, *Physalis angulata* and *F. miliacea*. The most suitable rate for 2,4-D and MCPA was about 1·8 kg. acid equivalent per ha. ; the most suitable rate for the brushkiller, expressed in kg. acid equivalent per ha., was 0·3-0·6 kg. 2,4,5-T and 0·6 kg. 2,4-D. The best time for spraying was 5-8 weeks after the rice plants had emerged. Spraying of weed-contaminated fields gave rice-grain yield increases of 800-900 kg. per ha.—W.J.B.

83 MELLO-SAMPAYO, T. and SILVA, M. VIANNA E. Ensaios preliminares sobre a determinação de resistência de algumas formas cultivades de arroz à *Piricularia oryzae* Br. et Cav. [**Preliminary trials to determine the resistance of certain forms of cultivated rice to *Piricularia oryzae*.**] 1954, pp. 38, bibl. 10, illus., English summary p. 37-8, Lisbon ; Minist. Econ., Comm. Reg. Comerc. Arroz. [Received April, 1953]

84 FERNANDO, H. E. and others. **Paddy pest control in Ceylon.** *Trop. Agriculturist* 1954, **110,** No. 3, 159-74, bibl. 8, illus.

85 YAMAMOTO, K. and MORI, T. **On the abnormal growth of lateral roots in rice plant.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 253, illus., English summary. [Univ. Tohoku]

The following effects of adding H_2S to the nutrient solution of rice plants were observed. Root growth was inhibited and parts severely injured showed necrosis. From just above the necrotic portion, many lateral roots grew, forming a bunch. Occasionally in old roots the lateral roots were prevented by lignification of the exodermis from emerging, and were elongated into the intercellular spaces of the cortex. Such phenomena took place through solution cultures both with, and without, H_2S. It is assumed that the anaerobic condition of the culture solution was the direct cause of the root injury, and H_2S might have promoted it.—From authors' summary.

86 TANAKA, M. and WADA, J. **Effects of low temperatures on blooming of rice plants seeded and transplanted late.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 254-7 and 260, English summary. [Aomori Agric. Exp. Sta.]

Through late sowing and transplanting, rice plants were exposed to cool weather at the time of flowering, and their flowering and fruiting capacity as affected by air temperature was studied. Even a slight rise in temperature after a period of temperatures sub-optimal for blooming was found to encourage flowering rather more than a period when the temperature remained unchanged at somewhat higher levels. Plants which on account of low temperature had lost vigour at the flowering stage, exhibited a lower fruiting percentage as a result of low temperatures than did plants grown under favourable conditions. The optimum temperature for flowering in the rice plant seems to lie, under natural conditions, between a daily maximum of from 29·5°C. to 32·5°C. and a daily minimum of from 19·5°C. to 22·5°C. With a daily maximum of below 24·5°C. flowering was significantly hindered.—From authors' summary.

87 MISRA, G. **Photoperiodism in rice : 7. Photoperiodic response of two early varieties of rice.** *Agron. J.* 1955, **47,** No. 9, 393-5, bibl. 14, illus. [Bot. Dep., Univ. Allahabad, India]

The strains used were T.N. 32, a selection from Baljati, and T.A. 64, a selection from Hansharaj. Seedlings 10, 20, 30, 40 and 50 days old were subjected to 10-hour photoperiods (8 a.m. to 6 p.m.) for a period of 1 month. In a second experiment, seedlings of the same age were subjected to 10-hour photoperiods up to ear emergence. The short-day treatments delayed panicle emergence in all cases; the delay in emergence was greatest in the case of plants treated when 10 days old. The relation between delay in heading and age of seedlings before treatment was essentially linear in the case of both varieties. Ten-hour photoperiods reduced tiller development in all cases where the plants were 30 days old, or less, when treatment was begun. Prolonged short-day treatment markedly reduced grain yields, particularly where the treatments were started at early growth stages. Exposure to short days for a period of 30 days had very little effect on grain yields, irrespective of the time when the treatments began. The effect of short day-lengths in reducing grain yields per plant was largely due to cumulative effects on panicle numbers per plant, panicle length, number of grains and spikelets per panicle and percentage of seed set.—P.J.B.

88 MORINAGA, R. and others. **Photoperiodic responses of rice varieties.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 258-60, English summary. [Nat. Inst. Agric. Sci.]

Twenty varieties supplied by 8 countries were grown from their earliest seedling stages under 4 different day-length conditions, namely, 10·5 hr., 11·5 hr., 12·5 hr. and natural day-length. Vegetative growth periods under the optimum day-

length were 40-60 days for Japanese varieties, 40-70 days for Burmese varieties, 50-80 days for Indian varieties, and 70-150 days for Javanese varieties. The longer limit of the optimum day-length was about 12 hr. for Japanese varieties, and it was clearly shorter for the southern varieties with two exceptions, Heenati (Ceylon) and Gendjah Ratji 277 (Java). Only the above exceptional varieties could produce ears under the natural day-length of Tokyo. Under the optimum day-length, the varieties of longer vegetative growth period produced more leaves in the main stem. A longer day-length than the optimum increased the number of the leaves, with the exception of the Javanese varieties of very long growth period.—Authors' summary.

89 DEGUCHI, M. and OHTA, Y. **Re-examination of the effect of liming on paddy rice (Part 3). Influence of Ca ion on the growth and the metabolism of rice-plant.** [Japanese] *J. Sci. Soil, Tokyo* 1955, **26,** No. 1, 11-14, bibl. 15. [Agric. Fac., Tokyo Education Univ.]

Rice plants were grown in nutrient solutions containing different amounts of Ca. Increasing the Ca concentration from 4 to 84 ppm. resulted in marked increases in the growth of tops and, in particular, roots. High Ca concentrations in the nutrient solutions decreased the K_2O content and increased the P_2O_5 content of the plants.—From authors' summary.

90 BROWN, J. C. and others. **Effects of phosphorus and copper salts on iron chlorosis of rice in flooded and non-flooded soil and the associated enzymatic activity.** *Soil Sci.* 1955, **79,** No. 5, 363-72, bibl. 15. [Agric. Res. Serv., U.S. Dep. Agric., Beltsville, Md]

Caloro rice plants grown on a naturally calcareous unflooded soil developed chlorosis, apparently due to Fe-deficiency. On similar flooded soil, chlorosis did not develop. Plants grown on flooded calcareous organic soil were highly susceptible to chlorosis where P and Cu salts were added to the soil ; P and Cu, added together, effectively limited the absorption and utilization of Fe on this soil. The P/Cu effect was thought to be a contributing factor to chlorosis in rice plants in these trials.—From authors' summary.

91 ISHIZUKA, Y. and TANAKA, A. **Studies on rice culture in peat land. 1. Characteristics of rice plant grown in high peat.** [Japanese] *J. Sci. Soil, Tokyo* 1955, **26,** No. 3, 88-96, English summary p. 96. [Agric. Fac., Hokkaido Univ.]

The results are given of studies to compare the metabolism of rice plants grown on peat and on mineral soils and of the edaphological characteristics of peat soils, with the object of determining why rice yields on peat soils during a cool season are commonly very low in Japan. It was concluded that during the flowering period of the plants, when the nitrogen requirement of the plants is also low, decomposition of peat occurs, liberating nitrogen. In cool seasons, the decomposition process is delayed and this upsets the normal metabolism of the plants in a manner similar to that caused by delayed applications of ammonia. Peat soils in the region studied had a very low content of available K at the time of flowering of the rice plants.—From authors' summary.

92 CHANDRARATNA, M. F. and FERNANDO, L. M. **Studies in the fertilizer response of rice. 1. Direct, residual and cumulative effects of various phosphatic fertilizers.** *Trop. Agriculturist* 1954, **110,** No. 3, 178-89, bibl. 4, illus. [Cent. Rice Res. Sta., Batalagoda and Rice Res. Sta., Tissamaharama, Ceylon]

At Batalagoda, applications of phosphate in various forms gave significant increases in rice yields in 5 out of 7 seasons. The forms of phosphate used did not differ significantly in performance. At Tissamaharama there was a significant response of yield to phosphate applications in all seasons. Generally, 20 lb. P_2O_5 per ac. were sufficient. —W.J.B.

93 WEST AFRICAN RICE RESEARCH STATION. **Report for 1953.** 1955, pp. 12, 1s. [Rokupr]

At Rokupr, rice planted 6-9 in. apart with 2-3 seedlings per stand proved to be better than the native method of using wide spacings and many seedlings to the stand. Superphosphate increased yields of rice on tidal rice land. In rice variety trials in 1952, D.99, D.114, B.G.79 and Lead, from British Guiana, and Afaa Mwanza, 2/16 and 2/8 from Tanganyika, were amongst varieties yielding 1574-1921 lb. per ac.—M.P.

GENERAL

94 GRAINGER, J. and others. **Climate and the yield of cereal crops.** *Quart. J. roy. met. Soc.* 1955, **81,** No. 347, 108-9, illus. [Dep. Pl. Path., W. Scot. Agric. Coll., Auchincruive, Ayr]

Climatic data were recorded from a meteorological station within experimental plots of oats, wheat, barley and beans. Significant and near-significant correlations obtained between climate and yield, for the period 1935-52, are tabulated for barley, oats, wheat and beans. Lower temperatures were more commonly related with increased yields than higher ones, and higher yield was invariably correlated with higher rainfall but with lower

bright sunshine. The results are discussed briefly.—From authors' summary.

95 ISTITUTO DI ALLEVAMENTO VEGETALE PER LA CEREALICOLTURA, BOLOGNA. Le più recenti razze elette (avena, frumento, mais, orzo, pomodoro, riso, segale, sorgo). [**The most recent selected varieties (oats, wheat, maize, barley, tomato, rice, rye, sorghum) of the Plant Breeding Institute for Cereal Cultivation of Bologna, Italy.**] *Publ. Ist. Allev. Veg. Cerealicolt., Bologna* 1953, pp. 39, illus. [Received Aug., 1955]

96 KELLY, A. F. **Cereal seed multiplication at the National Institute of Agricultural Botany.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 237-9, bibl. 2.

The production of 'certified original seed' of cereal varieties is described.The method found most practical for maintaining pure and uniform stocks of cereals is the 'ear-row' method. Two hundred ears of a cereal variety are selected at random, from a large multiplication stock, as typical of the original stock. Each ear is grown in separate rows and examined throughout the growing season and at harvesting for purity. The produce from the ear-rows is bulked and multiplied over 4 more seasons until the produce of 70-80 ac. is available for sale. At the same time a 3-year cycle of sales is maintained. Care is taken to prevent the accidental introduction of genetical impurities. —M.P.

97 HAGSAND, E. Hormonderivatens inverkan på stråsäd och lin efter besprutning vid olika tidpunkter. 2. Vårsäd. [**The effect of applying hormone weedkillers on cereals and flax after spraying at different times. 2. Winter cereals.**] *K. LantbrAkad. Tidskr.* 1954, **93,** No. 4, 235-81, illus.

The trials reported were carried out at Uppsala, Sweden, during 1949-51. Varieties of cereals used were: Edda and Ymer barley, Diamant II and Kärn II spring wheat and Bambu and Sol II oats. Herbicides used were Weedone (9-10% acid equivalent 2,4-D ethyl ester) and Agroxone (9-10% a.e. MCPA Na salt), both at rates of 10 l. per ha. in 1000 l. spray volume. Different plots (weed free) were treated during the period early May to early July, as far as possible at 2-day intervals. In barley, most abnormalities following treatment were caused by Weedone and were located in the ear. Straw abnormalities appeared to be most common following treatment with Weedone at the 2- to 3-leaf stage. In Edda (6-rowed), a maximum percentage of 14·4% of plants had straw abnormalities following treatment at the 2- to 3-leaf stage in 1950. In Ymer (2-rowed), a maximum of 29·1% of plants had straw deformities following treatment at the 1·8-leaf stage in 1950. Treatment with Agroxone never caused more than 1% of plants to have straw deformities. Ear abnormalities mostly took the form of opposite spikelets and were most frequent after spraying at the 2- to 3-leaf stage. Opposite spikelets were more frequent in Ymer than Edda. The effect of tillering on the incidence of abnormalities is considered in detail. Abnormalities caused to spring wheat were similar in type to those caused in winter wheat [See *Fld Crop Abstr.* 8 : 1180]. In Diamant II, the highest incidence of stem deformities occurred following treatment at the 2-leaf stage; treatment at the time the 3-leaf stage was reached caused few further stem abnormalities. Stem deformities were less frequent in Kärn II than in Diamant II. Treatment with Agroxone caused no stem deformities. The highest frequency of opposite spikelet deformities (90-100% of plants affected) occurred following treatment at the 3- to 4-leaf stage. The incidence of double spikelets caused was relatively low. Plant deformities caused by treatment of winter- and spring-wheat and barley were, in general, similar and easy to define. In oats, the deformities produced were relatively less well defined. Deformities caused in oats by Agroxone were so ill-defined and insignificant as to preclude effective measurement. The data given for oats refer only to one year's results and to trials with Weedone. The first treatments on 22 May resulted in nearly 50% deformed panicles; treatments at the 2-leaf stage caused 70-80% deformed panicles and treatment at the 3- to 5-leaf stage resulted in almost all panicles showing deformities. Later treatments resulted in progressively fewer panicle abnormalities. No varietal differences between Bambu and Sol II were noted. Stem abnormalities occurred following spraying at the 1-leaf stage and reached a maximum (about 30% of plants affected) at the 1·5- to 2-leaf stages. Treatment at the 3-leaf stage caused no stem deformities. The different types of stem and panicle deformities are described. Lodging in all crops was reduced by Weedone treatment, apparently as a result of the lighter ear produced by treatment. Weedone, but not Agroxone, resulted in some reduction in 1000-grain weight and, in the case of oats, a reduction in seed germination. With barley, Agroxone treatments resulted, in almost all cases, in slight yield increases, apparently the result of weed control, though the plots were kept weed-free as far as possible. In 1950, treatment with Weedone, at the 1·2- and 2·5-leaf stages resulted in yield reductions of about 5% and of about 12% after spraying at the 5·8-leaf stage, principally because of a very high incidence of the opposite spikelet deformity. In 1951, spraying at up to the 5·3-leaf stage caused yield reductions of about 20%. Stem deformities and opposite spikelets appeared to cause similar yield reductions.

Spring wheat reacted to treatment similarly to barley in terms of yield. With Sol II oats, in 1950, spraying with Weedone at the 1·3- to 6·8-leaf stages resulted in yield reductions ranging from about 12-14%. Agroxone also caused slight yield reductions. In 1951, spraying with Weedone at the 1·8-, 2·4- and 5-leaf stages resulted in yield reductions of about 5, 10 and 35%. Agroxone treatment resulted in slight yield increases in all cases. It was concluded that under normal conditions, treatment with MCPA could be given at any growth stage, provided that not more than the equivalent of 10 l. Agroxone per ha. were applied. The trials were conducted on soils with high organic-matter content and good moisture supply and the results may differ from those obtained on, for example, light, sandy soils. Early treatments, i.e. at about 2-3 weeks after sowing and when the weeds were in a suitable condition for treatment, were to be preferred to late treatments. MCPA was preferable to 2,4-D.—P.J.B.

98 ACOSTA, A. and LIVINGSTON, J. E. **Effects of calcium sulfamate and sodium sulfanilate on small grains and on stem rust development.** *Phytopathology* 1955, **45,** No. 9, 503-6, bibl. 7. [Pl. Path. Dep., Univ. Nebraska, Lincoln]

In field trials in Nebraska, 4 spring wheat, 2 spring barley and 2 oat varieties were treated with calcium sulphamate and sodium sulphanilate, each at rates of 9 or 12 lb. per ac. The plots were treated when about half the plants had completed pollination and half of each plot received an additional treatment at about 1 week later ; in the case of barley, the second treatment was made 4 days after pollination. In a further trial, Mida spring wheat was treated with both chemicals at rates of 9 or 12 lb. per ac. at the tillering stage, at 1 week after tillering, at the boot stage, the bloom stage, 6 days after flowering, or at 11 days after flowering. On untreated plots, stem rust (*Puccinia graminis tritici*) was relatively abundant. Calcium sulphamate reduced stem rust following a single 9 lb. per ac. treatment, particularly on barley and oats. Sodium sulphanilate was relatively less effective. The effect of the treatments on yield was variable. Calcium sulphamate increased wheat yields significantly following treatment with 9 lb. per ac. Two treatments with 12 lb. per ac. significantly reduced wheat yields. All treatments, except a single 9 lb. per ac. treatment, significantly reduced barley yields. Two applications of 9 or 12 lb. per ac. reduced oat yields. No treatment with sodium sulphanilate significantly reduced yield or kernel weight. Two applications of calcium sulphamate markedly reduced the germination of the seed of all crops ; single treatments did not significantly affect germination. Single treatments with calcium sulphamate caused no grain yield increases, regardless of stage of growth when applied. Applications made at tillering significantly decreased yields and applications made after pollination decreased seed germination. Sodium sulphanilate significantly increased grain yields when applied 1 week after tillering or 6 days after flowering.—P.J.B.

99† CLEGG, K. M. **A method for the estimation of starch and sugars in cereals using the anthrone reagent.** *Biochem. J.* 1955, **61,** No. 3, xvii, bibl. 2. [Rowett Res. Inst., Bucksburn, Aberdeenshire]

100 DAKSHINAMURTI, K. **Choline content of some south Indian foodstuffs.** *Curr. Sci.* 1955, **24,** No. 6, 194-5, bibl. 10. [Christian Med. Coll., Vellore]

The material studied included cereals and pulses. Findings are listed and compared with values reported in the literature. The cereals are low in choline : maize contains none. No choline is lost in the polishing of rice.—G.M.R.

101 GRADIN, H. and NYSTRÖM, B. Spannmålstorkning. [**Grain-drying (in Sweden).**] *Medd. 262. JordbrTekniska Inst.* 1955, pp. 48.

Aspects dealt with include : methods for determining the moisture content of grain, slow and fast grain-drying, heating installation and fuels, the care of grain after drying, and the economy of grain drying.—P.J.B.

102 OLOMUCKI, E. and BONDI, A. **Problems connected with ethylene dibromide fumigation of cereals. 1. Sorption of ethylene dibromide by grain.** *J. Sci. Fd Agric.* 1955, **6,** No. 10, 592-600, bibl. 15, illus. [Anim. Nutr. Lab., Agric. Res. Sta., Rehovot, Israel]

The cereals used were sorghum, barley, wheat and maize. Bromine was found to be present in the fumigated grains mostly as a volatile, unchanged ethylene dibromide and to a lesser extent as a non-volatile, water-soluble bromide. Differences in sorption of ethylene bromide by various cereals seemed to result from differences in seed structure. Under usual conditions of fumigation of whole grain in silos, the volatile bromide disappears after airing for 6-7 weeks, but the content of bound bromide is not markedly changed.—From authors' summary.

103 MUTHU, M. and PINGALE, S. V. **Control of insect pests in grains stored in insectic.de-impregnated jute bags.** *J. Sci. Fd Agric.* 1955, **6,** No. 10, 637-40, bibl. 10. [Cent. Fd Technol. Res. Inst., Mysore, India]

It was found that ethylene dibromide, when injected at the rate of 10 c.c. per 200 lb. bag into grain stored under non-airtight conditions in insecticide-impregnated jute bags placed vertically

or horizontally, completely controlled the insects present in the grain. For bags arranged in stacks, a dose of 7·5 c.c. per 200 lb. bag was found necessary for complete kill. Results with unimpregnated bags suggested that not all insects were killed by the ethylene dibromide.—From authors' summary.

104 MINISTRY OF AGRICUTURE, ARGENTINA. Conservación de granos y almacenamiento en silos subterraneos. Memoria preparada por el Servicio de Silos Subterraneos. [**Grain conservation in underground stores. Memorandum by the Underground Silos Service.**] 1949, pp. 222, bibl. in text, illus. [Buenos Aires] [Received July, 1955]

In 1948, 1540 underground grain silos, with a storage capacity of 849,300 tons, existed in the Argentine provinces of Córdoba, Buenos Aires and Santa Fe. The present memorandum outlines their initiation and development from 1941 onwards (pp. 1-27), and gives an account of experiments to determine the best type of construction (pp. 29-103) and the best measures for insect and rodent control (pp. 107-200). Current research (pp. 203-19) includes examination of silos for degree of hermetic closure ; sampling of grain from over 500 silos for moisture, germinating capacity and fatty-acid index ; study of variations in the conservation of wheat according to its position from periphery to centre of the silo ; and comparison of grain (wheat and maize) after 10 years' storage in open and hermetically sealed containers, respectively.—G.M.R.

LEGUMES

SOYABEANS

105 ADDOR, A. A. Consideracões acêrca da soja. [**Notes on the soyabean.**] *Publ. 797. Serv. Inform. Agric. Rio de Janeiro, Brazil* 1954, pp. 69, bibl. 54, illus. [Received April, 1955]

An account is given of the cultivation, utilization and nutritive value of the soyabean in Brazil.—W.J.B.

106 SEED WORLD. **New Grant soyabean. High-yielding variety for northern areas.** *Seed World* 1955, **77,** No. 7, 20.

Grant is a selection from a Lincoln × Seneca cross and is adapted to central Minnesota and north-eastern S. Dakota. It matures at the same time as Mandarin, about 3 days earlier than Chippewa and 4 days later than Norchief. In co-operative uniform soyabean varietal tests since 1949 in the northern States of the USA and in Ontario, Grant gave an average seed yield of 34·9 bu. per ac., compared with 32·2 bu. for Mandarin 33·6 bu. for Chippewa and 30·4 bu. for Norchief.—P.J.B.

107† MAISURJAN, N. A. [**Accelerating ripening of legume seeds by the defoliation method.**] [Russian] *Zemledelie* (*Agriculture*) 1953, **3,** No. 6, 58-61.

The success of chemical defoliation of the cotton crop in hastening boll ripening prompted the author to apply the method to other plants. Tests were made at the Experimental Station of the Timirjazev Agricultural Academy, Moscow, with crops which included *Lupinus albus* and *Glycine soja*. The early-ripening types of these crops do not mature in the Moscow area before mid-September or early October even in favourable years. *Lupinus albus* was treated (2 replications each) with the following solutions separately: (1) calcium cyanamide 15% (by volume) ; (2) sodium pentachlorophenolate 2% (by weight) ; (3) caustic soda 15% (by volume). The sprayings did not exceed 400 litres/hectare, and were applied on 18 August, when the pods on the main stem had begun to turn yellow (comparable with the beginning of wax ripeness). Treatment (3) resulted in the crop ripening 16 days earlier than the control ; treatments (1) and (2) produced ripening 12 and 11 days earlier, respectively. A study of the effect of treatment on grain weight and quality indicates that calcium cyanamide (treatment 1) is the most satisfactory defoliant because it interferes less with the crop's natural development and, consequently, with grain quality, than do the two other preparations. For example, the leaves are shed following treatment (1), but treatments (2) and (3) cause the leaves to wither but remain attached to the plant. Similar results were obtained with *Lupinus angustifolius*. Soyabeans were sprayed at the time when the pods on the lower part of the plant turned brown (13 Sept.). Treatment (3) accelerated ripening by 12 days (compared with 16 days in lupin) and treatment (1) by only 5 days. While the data obtained are only preliminary, crop treatment with calcium cyanamide may be of significance in extending the range of latitude to which the crops are adapted.—M.H.

108 SMITH, R. J. **The response of soyabeans to selected pre-emergence and post-emergence herbicides.** *Diss. Abstr.* 1955, **15,** No. 5, 666-7. [Univ. Illinois]

The trials reported were carried out in Illinois during 1953-4. Where several herbicides were compared as pre-emergence treatments, CIPC gave good weed control, with little injury to the soyabeans, DNOSBP caused initial injury, but no final yield reduction, while N-1-naphthyl ,phthalamic acid, NaPCP and 2,4-D amine salt gave variable and relatively less satisfactory results. Post-emergence directed spraying with Lion Herbicidal Oil No. 1 caused some initial injury to the plants, but no final yield loss. Seed yields were not reduced until stands were reduced to about half of those

initially present. DNOSBP was more toxic to germinating seed than was CIPC, while the opposite was the case with plants in the seedling stage. After 4 weeks in soil at a temperature of 85°F., most of the initial applications of CIPC had disappeared. No pre-emergence herbicide was completely satisfactory for use on soyabeans, though CIPC and DNOSBP gave the best results. Their effectiveness was greatly affected by weather conditions following application.—P.J.B.

109 SUN, C. N. **Anomalous structure in the hypocotyl of soyabean following treatment with 2,4-dichlorophenoxyacetic acid.** *Science* 1955, **121,** No. 3148, 641, bibl. 3, illus. [Inst. Divi Thomae Found., Cincinnati, Ohio]

A brief note is given on the histological response of the pith of the hypocotyl region in soyabean seedlings to 2,4-D. One of the most marked responses of the hypocotyl region was the tendency of its cells to become highly meristematic and to develop vascular strands in the pith. 2,4-D apparently disrupted the orderly metabolic and physiological processes in the plant tissues, resulting in non-polarized cell division and abnormal growth patterns.—P.J.B.

110 KATO, I. and NAITO, Y. **Anatomical investigation of flower-, bud-, and pod-drop in soybean plant.** [Japanese] 1955, **23,** No. 4, 251-2, English summary. [Tokai-Kinki Nat. Agric. Exp. Sta.]

111 BELIKOV, I. F. [**The local utilization of photosynthetic products in soyabean.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1955, **102,** No. 2, 379-81, bibl. 2, illus. [V.L. Komarov Far-Eastern Filial Acad. Sci. USSR]

The question of the movements of organic substances in plants, and their translocation in plant tissues during growth and development, has hitherto been studied very little, chiefly because of difficulties in technique. In the soyabean fields of the collective and State farms of the Far East USSR it has been observed that there are no fruits at the nodes of those plants from which the leaves fall prematurely. Furthermore, the author's tests on artificial defoliation of soyabean plants has confirmed that pods are either shed or remain undeveloped at the nodes from which leaves are removed (*Agrobiologija*, 1954, No. 2). Experiments are reported in which labelled carbon ($C^{14}0_2$) is used for treating the leaves (special apparatus illustrated). During the period of nutrient accumulation in the soyabean seed, radio-active carbon is concentrated in the seed of pods growing at the nodes of the treated leaves, and it is therefore concluded that photosynthetic products of the leaves at this period of seed filling are utilized locally (i.e. are not translocated).—M.H.

112 KAKU, S. **Climatic and growth periodical variation of osmotic value in soybean plants.** *Bot. Mag., Tokyo* 1955, **68,** No. 802, 114-18, bibl. 9. [Shimonoseki Commercial Upper Secondary Sch., Japan]

One mid-season and two late varieties of soyabeans were grown either in pots in soil at 80%, or in dry soil kept at 20%, of field moisture capacity. Determinations were made of the osmotic pressure of the epidermal cells of the plants. On the high-moisture soil, the late varieties started flowering on the 72nd day after sowing, and podding began on the 89th day. The mid-season varieties started flowering on the 60th day and began podding on the 66th day. On the low-moisture soil, the mid-season variety matured earlier and the late variety later than did the same varieties grown in the high-moisture soil. The osmotic pressure in the plants increased up to the time of flowering, then fell markedly, but started to rise again and reached its highest value at maturity. These trends were similar in both types of variety. In plants grown on low-moisture soil, the values of osmotic pressure were much greater than in plants grown on high-moisture soil. It was concluded that variations in osmotic pressure were primarily due to the growth rhythm of the plants and were only secondarily affected by meteorological conditions.—P.J.B.

113 KAKU, S. **Effect of the short day treatment on the growth periodical variation of osmotic value in soybean plants.** *Bot. Mag., Tokyo* 1955, **68,** No. 803, 150-4, bibl. 7, illus. [Shimonoseki Commercial Upper Secondary Sch., Japan]

A late-season soyabean variety was grown in: (a) natural day-lengths, (b) natural day-length up to 43 days after germination, and thereafter in short day-length, (c) short day-length from the 8th day after germination, onward. The short-day treatments accelerated both flowering and podding. The osmotic pressure of the epidermal cells of the plants increased as the plants aged, with slight decreases at the time of flowering and accelerated increases during flowering to podding. Osmotic pressure values increased as a function of the age of the plants and were relatively unaffected by the maturation of the reproductive parts of the plants. The periodic fluctuations in osmotic pressure as the plants flowered and podded were independent of the length of the growth period or photoperiodic influence.—P.J.B.

GROUNDNUTS

114 SHANKER RAO, M. G. and SRINIVASALU, N.

Sowing groundnut as pods. *Madras agric. J.* 1954, **41,** No. 12, 431-2. [Agric. Res. Sta., Tindivanam, South Arcot District, India]

The germination of shelled and unshelled TMV2 (bunch) and TMV1 (spreading) groundnuts, when sown in pots and in the field, was compared in 1951-3. The unshelled seed germinated 1 day later than the shelled. The percentage germination of unshelled seed was 20-30% lower than that of the shelled seed. A more detailed experiment was carried out in 1952-3 in which shelled seed, whole unshelled seed, pod bits and pods with tips broken were compared. In the case of both varieties the germination percentage and the speed of germination was significantly lower in the case of the unshelled seed than in that of the shelled seed. Shelled seed gave better germination than either pod bits or pods with tips broken. The highest yields were obtained by the use of shelled seed.—W.J.B.

115 OLLAGNIER, M. and GROS, D. Intérêt agronomique et économique de la culture de l'arachide à forte densité. [**Economic and agronomic advantage from growing groundnuts at a high density.**] *Oléagineux* 1955, **10,** No. 8-9, 547-55, bibl. 16, illus. [Inst. Rech. Huiles et Oléagineux]

Trials in Senegal with the late, semi-erect groundnut variety 28.206 showed an increase in yield of 100-200 kg. per ha. when the seed rate was increased from 80 thousand to 110 thousand seeds per ha. A trial in Senegal with the late, creeping groundnut variety 31-33 showed an increase in yield of about 250 kg. per ha. when the seed rate was similarly increased. A seed rate of 110 thousand seeds per ha. is recommended for the late groundnut varieties. From results of trials in the Middle Congo, Ubangi, Chad, Senegal and Madagascar, a seed rate of 160-200 thousand seeds per ha. is recommended for the early, erect groundnut varieties.—E.B.O.

116 STOREY, H. H. and RYLAND, A. K. **Transmission of groundnut rosette virus.** *Ann. appl. Biol.* 1955, **43,** No. 3, 423-32, bibl. 14. [E. Afr. Agric. and For. Res. Org., Kenya]

117 WEBB, J. A. and FOWDEN, L. **Changes in oxo acid concentrations during the growth of groundnut seedlings.** *Biochem. J.* 1955, **61,** No. 1, 1-4, bibl. 11, illus. [Bot. Dep., Univ. Coll., London]

118 SHEAR, G. M. and MILLER, L. I. **Factors affecting fruit development of the Jumbo Runner peanut.** *Agron. J.* 1955, **47,** No. 8, 354-7, bibl. 7. [Virginia Agric. Exp. Sta., Blacksburg]

The studies reported were carried out in 1949 and '50 with plants grown from a single plant selection of the Holland strain of Jumbo Runner groundnuts. Fruit development during each year was restricted to given periods during the fruiting season by the removal of certain pegs by clipping before they reached the soil. Studies were also made of the rate of development of fruit produced at different times during the flowering period. In 1949, pegs were : (a) left unclipped, (b) clipped until 26 July, or (c) until 23 August. The numbers of large fruits did not differ significantly between the treatments, while the clipping treatments significantly reduced the weight of large fruit per plant. In 1950, plants were : (a) left unclipped, (b) clipped up to 1 September, clipped from (c) 1 September, (d) 14 September, or (e) 1 October, up to the time of harvest. No treatment resulted in significant differences in the number or weight of large fruits per plant, weight of fruit per plant, or shelling percentage. The percentage of pegs producing fruit decreased with time during the flowering period. The rate of fruit growth decreased with increasing lateness of fruit formation.—P.J.B.

119 INOUYE, C. and MAEDA, K. **Morphological studies on the root nodules of Leguminosae. 3. Peanut** (*Arachis hypogaea* **L.).** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 245-6, English summary. [Fac. Agric., Univ. Kochi]

Generally the root nodule of the groundnut originates in the cortex at the base of the lateral root. No connexion was found between the location of root nodules and the direction of protoxylem radiation in the central cylinder of the lateral root. Infection by root-nodule bacteria takes place through the epidermis (root hairs and other epidermal cells) and through broken epidermis.—From authors' summary.

120 OLLAGNIER, M. and PREVOT, P. Liaison entre dégradation du sol et toxicité manganique. [**Relationship between soil degradation and manganese toxicity.**] *Oléagineux* 1955, **10,** No. 10, 663-6, bibl. 1, illus. [Inst. Rech. Huiles et Oléagineux]

A relationship between soil degradation, a low pH and symptoms of Mn toxicity in groundnuts was confirmed.—E.B.O.

PEAS

121 RIEPMA WZN, P. and VEENBAAS, A. Resultaten van het doperwtenrassenonderzoek oogst 1953 en 1954. Rassen met ronde zaden. Landbouwkundige eigenschappen. Kwaliteitseigenschappen. [**Results of varietal**

trials with round-seeded peas for canning in 1953-4 : agricultural characteristics and eating qualities.] *Tec. Ber. 67. Peulvruchten Stud. Comb.* 1955. [Peulvrucht. Stud. Comb. and Cent. Inst. Landbouwk. Onderz., Wageningen]

122 WIKLUND, K. Frösättning hos fältodlade ärter, *Pisum sativum* (L.) sens. ampl. Govorov. Kort sammanfattning av resultat från pågående fertilitetsundersökningar av ärter odlade i Norrland. **Seed setting in field-grown peas, *Pisum sativum* (L.) sens. ampl. Govorov. Brief summary of results from running fertility studies on peas grown in Norrland.** *Sverig. Utsädesfören. Tidskr.* 1954, **64,** No. 3, 211-19, bibl. 13, illus., English summary pp. 218-19.

To investigate the causes of variation in seed yield and seed set, trials were carried out during 1951-3 at the West Norrland Branch Station of the Swedish Seed Association with both yellow and grey fodder-pea varieties. Plots were established as far south as Ultuna and up to the extreme north of the Norrland district. The yellow peas had about 30% more pods than the grey peas. In yellow peas, the proportion of double pods (2 pods on one branch) to single pods was 14 times as great as in grey peas. A high proportion of seeds failed to reach full development, particularly in yellow peas; 27% more seeds in grey peas reached full maturity than in yellow peas. The relatively late grey peas Parvus and U05801 had a lower seed fertility at the West Norrland Station than other early grey peas. The annual variation in seed set was very great and was thought to be the main cause of wide annual variations in pea yields met with in practice. With grey peas, 11% of ovules were not fertilized and 20% in yellow pea varieties. In spite of the lower pod numbers, seed yields of grey peas were higher than for yellow peas. A negative correlation between pod numbers per plant and seed yields was established for yellow peas. The prevalence of ovule abortion was positively correlated with ovule numbers.—P.J.B.

123 WALLEN, V. R. **The effect of storage for several years on the viability of *Ascochyta pisi* in pea seed and on the germination of the seed and emergence.** *Pl. Dis. Reptr* 1955, **39,** No. 9, 674-7, bibl. 6. [Bot. and Pl. Path. Lab., Sci. Serv., Canada Dep. Agric., Ottawa]

In tests with pea seed which had been stored for 2-13 years, it was shown that storage for 7 years eliminated seed-borne infection with *Ascochyta pisi*, without causing significant loss of germination or causing reduction in seedling emergence.—From author's summary.

124 MCKEE, H. S. and others. **Physiology of pea fruits. 1. The developing fruits.** *Aust. J. biol. Sci.* 1955, **8,** No. 2, 137-63, bibl. 26, illus. [Pl. Physiol. Unit, C.S.I.R.O., and Bot. School, Univ. Sydney]

Pea fruits from 2 crops of the variety Canner's Perfection were sampled at different times from flowering. Changes in the fresh weight, dry weight, starch, soluble carbohydrate, protein N and soluble N in both seeds and hulls were followed in 1952 and 1953 and related to the changes in cell volume in the seeds. In 1953 respiration rates, phosphate, pectin and ascorbic acid contents were also investigated. The seeds gained more carbohydrate and N than was lost by the hulls. Starch and protein were synthesized rapidly by the seeds. The increase in starch content in the seeds was followed by a decrease in soluble carbohydrate content, after which the seed ceased to accumulate water. These metabolic changes are discussed in the light of recent biochemical knowledge, and in relation to more detailed biochemical investigations in progress.—Authors' summary.

125 BRIAN, P. W. and HEMMING, H. G. **The effect of gibberellic acid on shoot growth of pea seedlings.** *Physiol. Plant.* 1955, **8,** No. 3, 669-81, bibl. 10, illus. [I.C.I. Ltd., Akers Res. Labs., Welwyn, England]

Data are given of the quantitative growth response of pea seedlings to different amounts of gibberellic acid [see *Fld Crop Abstr.* 8 : 1103 and 1490], applied to the foliage, and of varietal differences in growth response. The varieties Meteor, Duke of Albany and Improved Pilot were used and gibberellic acid (in amounts ranging from 0·01-10·24 μg.) resulted in significant growth increases over untreated controls at 4 days after treatment. By 15 days after treatment it was apparent that increasing amounts of gibberellic acid resulted in progressively increasing growth responses ; the growth response showed a linear relation to log. dose. In the case of the other two varieties, this increasing growth response to increased doses of gibberellic acid was not noted. In trials with 11 pea varieties, 14-day-old plants were sprayed to incipient run-off with either 10 or 100 μg. per ml. of gibberellic acid, or 2 or 20 μg. per ml. of indolylacetic acid (IAA). Both rates of gibberellic acid resulted in large growth responses, while the 20 μg. per ml. IAA treatment, only, resulted in significant growth increases (just reaching the 1% level). The rapid-growing varieties showed little or no response to gibberellic acid, while the slow-growing, dwarf varieties showed a large growth response. Suitable amounts of gibberellic acid were almost able to eliminate the normal differences between dwarf and tall varieties.—P.J.B.

126 PARKIN, E. A. and BILLS, G. T. **Insecticidal**

dusts for the protection of stored peas and beans against bruchid infestation. *Bull. ent. Res.* 1955, **46,** No. 3, 625-41, bibl. 26. [Pest. Infest. Lab., Slough, Bucks]

Results from laboratory trials indicated that control of the bean beetle (*Acanthoscelides obtectus*) and the cowpea beetle (*Callosobruchus chinensis*) in stored peas and beans is achieved by mixing thoroughly into 200 lb. of the commodity, 6-8 oz. of one of the following dusts : colloidal silica, colloidal aluminium pentasilicate, finely ground diatomite, 0·05% γ BHC (as Lindane) on diatomite or kaolin, 0·5% technical DDT on diatomite or kaolin. When Lindane or DDT are used in the recommended doses, it is unlikely that the commodity will be tainted or rendered toxic to man or animals.—E.B.O.

BEANS

127 PICARD, J. and others. La culture de la féverole-grain. Quelques données d'expérimentation réalisée en 1952, 1953 et 1954 dans la moitié nord de la France. [**Cultivation of the field bean for seed. Some results of experiments conducted in 1952, 1953 and 1954 in the northern half of France.**] *Ann. Inst. nat. Rech. agron., Paris. Sér. B. Ann. Amélior. Pl.* 1955, **5,** No. 1, 79-102, bibl. 4. [Sta. Cent. Génét., Amélior. Plantes, Versailles ; et Sta. Amélior. Plantes du C.R.A. de l'Ouest ; École Nat. Agric. de Rennes]

The characteristic features of varieties of *Vicia faba* from Germany, the Netherlands, Sweden, N. Africa, and various parts of France are described and their performance after autumn- and spring-sowing in different regions of France observed. In a study of cultivation technique, the influence of date of sowing and population density on yield, date of maturity and intensity of attack by bean fly were investigated. Owing to the low productivity of winter beans, it is recommended that spring beans should be sown in autumn in regions where the winters are not too severe and the spring is dry. In regions with a good rainfall in spring and early summer, spring beans should be sown in spring ; in the Paris region as early as possible. Among the factors contributing to yield, size of seed is the most important. Size and number of seed are fairly constant within plants of a given variety whereas the number of stems per plant and number of pods per plant fluctuate and are therefore not suitable characters on which to base selection. [See also *Fld Crop Abstr.* 7 : 134 and 874.]—D.B.

128 DERENNE, P. L'amélioration de la féverole. [**Improvement of the field bean.**] *Rev. Agric., Brux.* 1955, **8,** No. 8, 1038-9. [Sta. Rech. État, Gembloux, Belgium]

Yields of the variety Minor were approximately the same as of the Dutch variety Niki ; Minor has the advantage of being earlier and more uniform in maturing. A sowing rate of 60 seeds per m.^{2} with rows 20 cm. apart gave the ideal population density.—D.B.

129 YAHIRO, M. and INOUE, T. **Physiological changes in the germination [of] seeds during the low temperature treatment. 1. On the water content, the specific gravity of the tissue powder and the concentration of reducing sugars of horse bean.** *Bot. Mag., Tokyo* 1955, **68,** No. 800, 45-50, bibl. 12. [Agric. Fac. Univ. Kagoshima, Japan]

Studies are reported on changes in moisture content, the specific gravity of the tissue powder and the amount of reducing sugars following low-temperature treatment of horse beans at 7°C. and 0°C.—From authors' summary.

OTHER

130† CANTILLON, P. Essais sur vesce commune de printemps. [**Trials with common spring vetch.**] *Rev. Agric., Brux.* 1955, **8,** No. 8, 1040-6. [Sta. Rech. État, Gembloux, Belgium]

In the first series of experiments the cultivation of common spring vetch (*Vicia sativa*) for seed was studied. It was grown in a pure stand, and with various proportions of each of spring wheat, oats and field beans (*Vicia faba*). The seed yield from the pure sowing was 1079 kg./ha. but for a seed harvest from a pure stand to be an economic proposition there would need to be a yield of at least 2700-2800 kg./ha., and this is not possible with commercial varieties. The cultivation of vetch for seed is economic only when vetch is sown with a cereal, the latter at a high density. The best yield was obtained when vetch was sown with spring wheat in the proportion 1 : 5. Field beans had a depressive effect on the yield of vetch. The second series of experiments was concerned with disease resistance and yields of varieties from various sources. The best varieties were Sötvicker and Gravicker from Svalöv, Sweden, and the Nordsaat varieties from Germany.—D.B.

131† GRINDLEY, D. N. and AKOUR, A. A. **The seed oils of *Bombax sessile* and of *Lupinus termis*.** *J. Sci. Fd Agric.* 1955, **6,** No. 8, 461-5, bibl. 10. [Wellcome Chem. Labs. Minist. Health, Khartoum, Sudan]

Lupinus termis is cultivated in the Sudan and neighbouring countries for food and fodder. Its seeds, which are eaten after soaking in water, are

a valuable source of protein. Its oil resembles that from other members of the Papilionaceae.—M.P.

GENERAL

132† Beretta, O. As leguminosas e suas bactérias. [**The Leguminosae and their bacteria.**] *Rev. Agric., Piracicaba* 1955, **30,** No. 4-6, 113-32, bibl. 25.

This review includes a list of legumes with their respective nodule bacteria, and lists of legumes for green manure, soil conservation and fodder, of interest for Brazil.—E.B.O.

133 Winslow, R. D. **The effects of some leguminous crops on the soil population level of pea root eelworm.** *Pl. Path.* 1955, **4,** No. 3, 86-8, bibl. 4. [Sch. Agric., Univ. Cambridge, England]

Field and microplot studies were carried out to determine the effect of a wide variety of leguminous crops on pea root eelworm (*Heterodera göttingiana*) populations. The results showed that field beans (*Vicia faba*) appeared to be less susceptible to attack, less efficient hosts than peas and to result in substantial reductions in eelworm populations in many cases. Vetches [*Vicia* spp.] appeared to be efficient hosts of pea root eelworm and were considered unsuitable as a crop for eelworm-infested land. All the other non-host legumes tested, including lucerne, *Lathyrus clymenum, Onobrychis sativa, Trifolium hybridum, T. repens, T. pratense* and *Anthyllis vulneraria* resulted in reductions in the number of eggs and cysts per g. of soil.—P.J.B.

134 Rohatgi, K. and others. **Effect of germination on vitamin B_{12} values of pulses (leguminous seeds).** *J. Nutr.* 1955, **56,** No. 3, 403-8, bibl 11. [Physiol. Dep., Presidency Coll., Calcutta, India]

ROOTS

SUGAR-BEET

135 Maughan, G. L. **Precision drilling and mechanical thinning of sugar beet.** *Priority Gen. Rep. Inst. internat. Rech. Better. 18th Winter Congr. 1955* pp. 75. [N.I.A.E., Silsoe]

Specialists in the member countries of the Institut International de Recherches Betteravières were sent a questionnaire on precision drilling and mechanical thinning of sugar-beet. Replies were received from Austria, Belgium, Canada (Manitoba), Denmark, France, Germany (Western), Great Britain, Ireland, Italy, the Netherlands and the USA. Information was sought on: acreage under sugar-beet, seed-bed preparation, type of seed used, seed drills, mechanical thinning, hand-work, cross-blocking, bunching, down-the-row thinners and possible future developments. From the details contained in the replies, a general report was prepared. The individual replies are given in the appendix.—M.P.

136 Heinisch, O. Winterrübensamenbau durch Sommeraussaat. [**Summer sowing for producing seed of winter [sugar-] beet.**] *Dtsch. landw. Pr.* 1955, **78,** No. 15, 215-16, illus.

Experience gained from many trials in the production of elite seed of sugar-beet by summer sowing is reproduced here. The region selected for seed production should preferably have a high rainfall in August and September, failing which the fields should be irrigated. The preceding crop (early potatoes, peas or winter barley) should be one that can be harvested in time to sow the beet by the end of July so that the plants can emerge during August and have their roots firmly established before a cold spell disturbs the soil. For elite seed, the sowing rate is 8 or 12 kg./ha. (according to whether the conditions are favourable or rather less so) with drill rows 30-40 cm. apart. A high plant density is required because, on the whole, one seed stalk develops per plant. The seed crop is harvested as soon as the seed coat of most of the glomerules is brown; it is cut with a grass mower or cutter and binder.—D.B.

137 Rusconi-Camerini, Giovanna. Osservazioni sulle correlazioni tra alcuni caratteri della barbabietola zuccherina con particolare riguardo ai tipi "P" e "Z". [**Observations on the correlations between some characters of sugar-beet with particular reference to the types " P " and " Z ".**] *Ann. Sper. agr.* 1955, **9,** No. 4, 811-24, bibl. 19, English summary pp. 822-3. [Sta. Sper. Bieticolt., Rovigo, Italy]

Sugar-beet grown in Italy are grouped into 3 types: N (normal), P (weight) and Z (sugar). Results of the investigation described indicated that sugar-beet type Z is characterized by a high density coefficient, low radius and high ring number; and sugar-beet type P by a low density coefficient, high radius and low ring number. The correlations between these and other characters were studied.—E.B.O.

138 Frese, H. and others. Über die Wirkung der Verteilung organischer und anorganischer Düngestoffe im Boden auf das Wurzelwachstum von Zuckerrüben. [**The effect of the distribution of organic and inorganic manures in the soil on root growth of sugar-beet.**] *Z. PflErnähr. Dung.* 1955, **69,** 1-3, 198-205,

bibl. 14, illus. [Inst. Bodenbearbeitung, Braunschweig-Völkenrode, W. Germany]

A series of experiments was conducted in which the effect of soil factors on the shape of the sugar-beet root were studied one at a time. Mineral fertilizers applied at different depths caused lateral roots to be laid down at different distances from the apex and this in turn altered the general shape of the main root. Insufficiently broken up stable manure, being in a variable state of decomposition, provided a non-homogeneous environment which caused root deformation. Unbroken clods of earth caused deformed roots partly by their mechanical action, but also, as in unevenly decomposed stable manure, by the physiological action of the uneven distribution of nutrients, air and water. 26 photographs illustrate the type of deformation produced by various soil conditions.—D.B.

FODDER-BEET

139† CALDER, A. **Fodder beet for pigs.** *Rhod. agric. J.* 1955, **52,** No. 3, 238-45.

The use of fodder-beet for pig feeding in Southern Rhodesia appears promising. Difficulties which are encountered include the unreliability of crop yields, and the impracticability of storage which results in this fodder being available for only a limited period of the year.—M.P.

140 MINISTRY OF AGRICULTURE, REPUBLIC OF IRELAND. **Twenty-third annual report of the Minister for Agriculture 1953-54.** [n.d.], pp. 190, append. + index pp. 87. [Received August, 1955]

Fodder-beet trials, pp. 68 and 19 [append.]. In one trial, Hunsballe X yielded more total dry matter per ac. than Pajbjerg X, Pajbjerg Rex X and Hinderupgaard. In another trial, Yellow Globe mangel gave the highest root yield, but Red Øtofte X significantly outyielded the other varieties in dry matter. In strip trials, Hunsballe and Padjberg [Pajbjerg ?] were compared for total yield of roots and tops. The differences were not significant but Hunsballe was easier to harvest mechanically whereas Padjberg ([Pajbjerg ?] was easier to pull by hand than the other variety.—M.P.

141 JÄHNL, G. Ergebnisse der Rübenversuche des Jahres 1954. [**Results of beet trials in 1954.**] *VersErgebn. Bundesanst. alp. Landw., Admont* 1955, No. 28, pp. 56. [Bundesanst. Alp. Landw., Admont, Austria]

Fodder-beet. 21 varieties were tested at 5 locations in different climatic regions of Austria. Zentaur was the standard of comparison for yield of roots, dry matter, sugar and crude protein ; for these properties Zentaur, Ovana and Corona were the best varieties. For comparing yield of tops, Rosa Beta, a variety rich in leaves, was used as the standard, but Zentaur and Strubes BK were significantly superior to Rosa Beta in 2 of the 3 locations where yield of tops was studied. Sugar-beet. Beta 242/53 and Hilleshög were in the top class as regards yield of roots, dry matter and sugar. Swedes. Of 8 varieties, Hoffmanns weisse Riesen was the best for yield of roots, dry matter, sugar and tops. Swedes gave approximately the same yields as fodder-beet while making less demand on the soil, and for this reason the cultivation of swedes should be a paying proposition especially at high altitudes. It is noted that where sowing was as late as mid-May, yields were approximately halved. The best yields were obtained when the density was 100,000-160,000 plants per hectare. —D.B.

142 MCALLISTER, J. S. V. and MCCONAGHY, S. **Manurial experiments with fodder beet.** *Res. exp. Rec. Minist. N. Ire. 1952-53* 1955, **3,** 40-5, bibl. 2.

Muriate of potash, at 2 cwt. per ac., and agricultural salt at 4 cwt. per ac., when applied alone or together, increased the yields of roots and tops of fodder-beet. Nitrogenous fertilizers appeared to vary in their effect on root yields, but the yields of tops rose with increased N applications. The form of N used did not appear to matter.—M.P.

143† CASTLE, M. E. **The effect of winter weather on the composition of fodder-beet left in the ground.** *J. Sci. Fd Agric.* 1955, **6,** No. 10, 579-81, bibl. 8. [Anim. Husb. Dep., Vet. Fac., Univ. Liverpool]

Fodder-beet, variety Pajbjerg Rex X, was sown in April, 1953, and the roots left in the ground until April, 1954. From October to April samples of roots and tops were analysed. Results show that when fodder-beet of high dry-matter content is left in the soil over the winter its chemical composition, palatability and soundness undergo little change. The root samples compared favourably with fodder-beet stored in a straw-covered clamp.—M.P.

144 CORNFORD, C. E. **Maleic hydrazide as a shoot depressant for clamped mangolds and fodder beets.** *Pl. Path.* 1955, **4,** No. 3, 89-90, bibl. 3, illus. [Dunholme Fld Sta., Nr. Lincoln, England]

Orange globe mangels and Hunsballe fodder-beet were sprayed on 2 Sept., 16 Oct. and 4 Nov., 1953, with 1, 0·5, 0·25 and 0·12% solutions of maleic hydrazide (triethanolamine formulation) applied in 100 gal. spray volume per ac. The roots were harvested on 4 Nov. and clamped in the field. As judged by observations made on 7 April, 1954, spraying in October resulted in the greatest degree of sprout inhibition with mangels. Mean shoot lengths where 1, 0·5, 0·25 and 0·12% solutions were

applied on 16 Oct. averaged nil, 0·1, 0·3, 0·1 and, for untreated controls, 4·3 in., respectively. Treatment on 4 Nov. was most effective for inhibiting sprouting in Hunsballe fodder-beet. Treatment on 4 Nov. with 1, 0·5, 0·25 and 0·12% solutions resulted in respective mean shoot lengths of 0·6, nil, 0·1 and 2·3 in., compared with 3·7 in. for controls. Under storage conditions in a warm cellar, untreated roots produced sprouts freely. Mangels treated with 0·25% solutions of MH showed no sprouts on 29 March ; similarly treated fodder-beet roots showed sprouts 1 in. long by that date.—P.J.B.

POTATOES

145 WHEELER, E. J. **White potatoes in Japan.** *Rep. 142. Nat. Res. Sect. Allied Powers H.Q.* 1951, pp. 40, bibl. 13, illus. [Received 1955]

Potatoes are a comparatively new crop in Japan, but their cultivation has increased since 1930 and prospects for further development are good. An account of present cultural methods and of measures for improvement is given.—G.M.R.

146 WERNER, H. O. **Potato planting rates with dryland culture in western Nebraska.** *Amer. Potato J.* 1955, **32,** No. 6, 197-206. [Nebraska Agric. Exp. Sta., Lincoln]

Yield trials over several years indicated that the intermediate planting rate tested, approximately 12 bu. per ac., was best. With this rate, close planting of small seed-pieces was preferable to planting seed-pieces of double the weight at twice the distance.—From author's summary.

147 MOURSI, M. A. **Effect of intensity, and width of inter-row tillage on the yield of the potato crop.** *Amer. Potato J.* 1955, **32,** No. 6, 211-14, bibl. 6. [Ein Shams Univ., Cairo, Egypt]

Results from trials carried out with the potato variety Kerr's Pink in 1951, and Red Skin in 1952, at the Edinburgh Univ. Agric. Exp. Farm, Roslin, indicated that : (a) potato yields did not increase when the number of inter-row tillages was increased from 2 to 3 ; (b) wide inter-row tillage, approximately 6 in. from the plants, should be used in the earlier stages of development, and narrow inter-row tillage, approximately 8 in. from the plants, when growth is more advanced.—E.B.O.

148 AKELEY, R. V. and others. **Potato variety yields, total solids, and cooking quality as affected by date of vine killing.** *Amer. Potato J.* 1955, **32,** No. 8, 304-13. [Maine Agric. Exp. Sta., Orono]

Results from 3 years' trials with 8 potato varieties and 4 dates of haulm-killing, 15 and 25 August, 4 and 18 September, indicated that early haulm-killing resulted, on an average, in lower yields, lower percentages of total solids and inferior colour of chips and French fries than later killing. Varietal and seasonal differences were apparent.—From authors' summary.

149 BRADLEY, G. A. and PRATT, A. J. **The effect of different combinations of soil moisture and nitrogen levels on early plant development and tuber set of the potato.** *Amer. Potato J.* 1955, **32,** No. 7, 254-8, bibl. 4.

In the experiment described, carried out in New York State, high soil-moisture levels (75 and 50%) resulted in higher weight of tops, earlier tuber set and higher tuber weight than did lower moisture levels. The principal effect of moisture level on tuber set seemed to be on the earliness of set rather than on the total number of tubers. As the season progressed, the higher N levels tended to produce higher weights of tops than did the lower N levels. For the most part, there were no significant differences in tuber weight due to N level. The effect of N level upon the number of tubers set was also small. [See also *Fld Crop Abstr.* 8 : 528.]—E.B.O.

150 NYLUND, R. E. and others. **Mechanical damage to potatoes during harvesting and handling operations in the Red River Valley of Minnesota and North Dakota.** *Amer. Potato J.* 1955, **32,** No. 7, 237-47, bibl. 8. [Minnesota Agric. Exp. Sta.]

A survey on 13 farms showed that : (a) field harvesting operations caused mechanical injury (cuts, bruises and cracks) to 26% of the potatoes handled ; 4% of this damage was serious enough to decrease grade ; (b) in addition to this damage, an average of 16% of the skin was removed from potatoes before they reached the storage bins ; (c) potato samples, which had 8% mechanical damage when placed in storage, showed 34% mechanical damage after 6 months' storage at 36-40°F. ; during this period bruises, which decreased grade, increased from 6 to 9%. A survey in 5 warehouses, in which potatoes were graded without washing, showed that this process caused 12% mechanical injury to potatoes. In 4 warehouses, in which washed potatoes were graded, mechanical injury caused to potatoes by this process was approximately 3%.—E.B.O.

151 CULLEN, J. C. **Second Early potato variety trials, 1946-1953.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 320-40, bibl. 1.

The results of the Second Early yield trials are considered in detail. Of the recent introductions, Craigs Alliance was least liable to losses of seed due to disease but produced variable amounts of cover. Yields were comparable with Arran Banner

but there are indications of relatively poor yields in low rainfall areas. Craigs Royal showed indications of response to soil type, planting date and rainfall, with higher relative yields on heavier soils, with later planting and with higher rainfall. Ulster Emblem gave similar yields to Craigs Royal but showed tuber defects more frequently, with a tendency to lowest relative yields on lighter soils. Ulster Ensign gave lower yields on average than the other varieties and showed greatest field susceptibility to blight on foliage and tubers.—From author's summary.

152 CLAVER, F. K. and others. Influencia de los meristemas y desbrotes en el periodo de incubación de tubérculos de papa. [**Influence of the meristem and of desprouting on the formation of new tubers by potatoes.**] *Rev. Fac. Agron., Eva Peron* 1954, **30,** No. 2a, 215-19, bibl. 4.

The influence on the development of new tubers of (a) the number of sprouts per tuber and of (b) the frequency of desprouting was investigated. Katahdin potatoes were used. In experiment (a), groups of potatoes which sprouted on the same day were treated every 5 days so that they had 1, 2, 3 or 4 sprouts per tuber. The formation of new tubers began first in the groups with 1 or 2 sprouts per tuber but the process of new-tuber formation was completed 11 days earlier in tubers with 3 or 4 sprouts than in tubers with 1 or 2 sprouts. In experiment (b), groups of halved tubers were completely desprouted every 5, 10, 20 or 30 days. Control halves of potatoes were not desprouted. The period between sprouting and the first formation of tubers was increased by 32, 21, 14 and 18 days (compared with the unsprouted halves) by the removal of sprouts every 5, 10, 20 and 30 days, respectively. Thus, in general, new-tuber formation was increasingly delayed by desprouting at increasingly frequent intervals.—W.J.B.

153 ÅBERG, E. Hormonderivat mot ogräs i potatisodlingar. [**Hormone preparations against weeds in potato crops.**] *Lantm. Svenskt Land* 1954, **38,** No. 24, 599-51, illus.

A review is given of the results of a number of trials in Sweden on the use of MCPA and 2,4-D for weed control in potatoes. Where potatoes were sprayed when 15-25 cm. high with MCPA (Agroxone), plant deformities were considerably less prevalent than following 2,4-D treatments. The relatively permanent nature of leaf deformities following treatment was such as to render the use of these herbicides on seed crops inadvisable. Tuber yields were not adversely affected where 2-8 l. Agroxone (10% Methoxone preparation) in 600 l. spray volume per ha., were applied, despite plant deformities. The application of 1-2 l. Dif (20% 2,4-D amine preparation) per ha. resulted in yield reductions, ranging up to 6% below those of controls. From these results, it is recommended that amounts of 5-8 l. of 10% Methoxone preparations per ha. should be used when the plants are 15-25 cm. high.—P.J.B.

154 COX, A. E. **Effect of blight on yield of maincrop potatoes.** *Agriculture, Lond.* 1955, **62,** No. 3, 138-41, bibl. 3, illus.

The value of protective spraying and haulm destruction in relation to blight incidence, and their effect on crop yields are discussed.—M.P.

155 MÜLLER, K. O. and others. **Testing "true resistance" of the potato to blight, *Phytophthora infestans.*** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 341-54, bibl. 19, illus.

Laboratory and glasshouse methods of testing potato varieties and seedlings for 'true resistance' to potato blight are described. The interpretation of results of tests on tubers, sprouts, leaves and other parts of the plant and the reaction of various tissues to different strains of *Phytophthora* are described.—From authors' summary.

156 STEVENSON, F. J. and others. **Reactions of potato varieties to late blight and insect injury as reflected in yields and percentage solids.** *Amer. Potato J.* 1955, **32,** No. 6, 215-21. [U.S. Dep. Agric., Beltsville, Md]

157 GIGANTE, R. Ricerche sulla trasmissibilità della maculatura ferruginea dei tuberi di patata. [**Investigations on transmissibility of internal brown spot in potato tubers.**] *Boll. Sta. Pat. veg.* 1953, **11,** 133-48, bibl. 32, illus.

The potato varieties in Italy which show the highest percentages of tubers affected by internal brown spot are : Oberarnbacher frühe 92%, Home Guard 84%, Sharpe's Express 76%, Majestic 63%, Wekaragis 64%, Wiga 60% and Étoile du Léon 56%.—From author's summary.

158 OKAZAWA, Y. **Physiological studies on the mechanism of tuberization of potato plants. 1. On the tuber formation of potato stem segment cultured under sterile conditions.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 247-8, illus., English summary. [Fac. Agric., Univ. Hokkaido]

The variety Irish Cobbler was used. In a synthetic medium containing low concentrations of sucrose (2% and 4%), stem segments developed lateral buds but no tubers. With high concentrations of sucrose (6%, 8% and 10%), tuber formation occurred at the tips of the lateral buds and the rate of formation was accelerated in proportion to the increase of sucrose concentration in the

medium. The effects of maltose, glucose and fructose were similar to that of sucrose.—From author's summary.

159 CHAPMAN, H. W. **Potato tissue cultures.** *Amer. Potato J.* 1955, **32,** 207-10, bibl. 8. [Nebraska Agric. Exp. Sta., Lincoln]

An account is given of experiments in growing potato tissues *in vitro* to study tuberization.—E.B.O.

160 TAGAWA, T. and OKAZAWA, Y. **Physiological and morphological studies on potato plants. 18. On the influences of nature and of age of seed tubers on some physiological behaviours at the time of sprouting of the tubers.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 249-50, English summary. [Fac. Agric., Univ. Hokkaido]

At the time of sprouting of normal and greening potato tubers, ascorbic-acid content decreased considerably, which, in turn, caused a striking rise of amylase activity, while phosphorylase activity fell gradually.—From authors' summary.

161 ZAFAR, M. A. **Application of certain hormones to prevent flower abscission in two potato (*Solanum tuberosum*) varieties.** *Amer. Potato J.* 1955, **32,** No. 8, 283-92, bibl. 8, illus. [Cornell Univ., Ithaca, N.Y.]

Results from an experiment in which potato plants of the varieties Canoga and Russet Burbank at different stages of development, i.e., seed tubers, plants four inches high, fully grown plants and plants in the bud stage, were sprayed with aqueous solutions, at 25 ppm., of seven hormones, showed that the variety Canoga produced flowers and fruit when sprayed with any of the hormone preparations at any stage of development, but that treatment of fully grown plants with 2,4-D was best; this was followed by treatment with IBA, 2,4,5-TCPA and 2,4,5-TCPP. Russet Burbank was more selective than Canoga as to stage of plant growth and type of hormone. The best flowering and fruit set from Russet Burbank was obtained by treating plants four inches high with NAA and 2,4,5-TCPP.—E.B.O.

162 STILLE, B. Untersuchungen über die Hitzetoleranz der Kartoffel. [**Experiments on the heat tolerance of potatoes.**] *Z. Pflbau* 1955, **6,** No. 3, 125-33, bibl. 11, illus. [Inst. PflKrankheit., Univ. Bonn, W. Germany]

Dark sprouts (the thinnest organ of the potato plant) and leaves of sprouts were examined after being placed in hot water at 45-60°C. for periods of 0-240 min. The resulting injury was assessed by the subsequent growth and development of these sprouts in turf, leaf necrosis and the topographical tetrazolium test. After a temperature of 45°C., the growth rate of sprouts actually increased (compared with controls) during the first half hour; up to 1 hr. the plant suffered no injury, but after 2 hr. growth slowed down and ceased after 4 hr. Since different varieties reacted in the same way, it was concluded that there is no varietal difference in protoplasmic resistance to heat. In leaves, necrosis was the first symptom of heat injury. Degree of necrosis, however, could not be used to determine the heat tolerance of different tissues of the leaf. This was done by the tetrazolium test. A relationship on a logarithmic scale was established between temperature and the time interval before death of cells.—D.B.

163 KORTLEVEN, J. Organische und anorganische Stickstoffernährung. [**Organic and inorganic nitrogen nutrition.**] *Z. PflErnähr. Dung.* 1955, **69,** No. 1-3, 234-42, illus. [Landw. Versuchsanst. und Inst. Bodenforschung T.N.O. Groningen, Neth.]

The relative effects of each type of N-manuring were assessed by the depth of green of potato tops.—D.B.

164 KANDIAH, S. and RODRIGO, D. M. **Manurial experiment with potato at Rahangala [Ceylon].** *Trop. Agriculturist* 1954, **110,** 190-200, bibl. 9, illus.

165 GROSKREUTZ, —. Knollenerwarmung bei der Kartoffelernte. [**Rise in temperature in potato tubers during harvest.**] *Dtsch. landw. Pr.* 1955, **78,** No. 16, 233. [Heikendorf b. Kiel, W. Germany]

Figures are given which show the influence on the subsequent temperature within the potato clamp of the length of time during which potatoes lifted on a sunny day are left lying in the sun.—D.B.

166 BURTON, W. G. and others. **The storage of ware potatoes in permanent buildings. 2. The temperature of unventilated stacks of potatoes.** *J. agric. Sci.* 1955, **46,** Pt. 2, 150-63, bibl. 12, illus. [Ditton Lab. Low Temp. Res. Sta., DSIR]

[See *Fld Crop Abstr.* 6 : 225.] Under normal English storage conditions, the heat production of mature potatoes drops rapidly after harvesting. Sprouting is accompanied by an increase in the rate of heat production. The difference in temperature between the potatoes and the ambient air is a function of the heat production of the potatoes and of the height of the stack and is mainly independent of its other dimensions if these exceed twice the height. Overheating is possible at both the beginning and end of the storage season, when heat production is high and the outside temperatures also possibly high. In general it is safe to store unventilated potatoes to a height of about 6 ft. if

they are mature, though if they are harvested with a great deal of earth late storage should not be attempted. If there is no intention of storing late, and the potatoes are fairly clean, storage to a height of 12 ft. may be permissible. Immature potatoes should not be stored to a height of more than 3 ft.—From authors' summary.

167† Treadway, R. H. and others. **Natural dehydration of cull potatoes by alternate freezing and thawing.** *Amer. Potato J.* 1955, **32,** No. 8, 293-303, bibl. 5, illus. [Maine Agric. Exp. Sta., Orono]

Trials carried out in 1950-2 indicated that natural freeze-drying of potatoes seems practicable for converting cull potatoes into a partially stable feed, thus extending the potato feeding period into late spring and early summer. Potatoes on open racks lost 30-40% of their total solids during this process, but the solids lost, which were mainly non-starch substances, acted as soil fertilizers. Spreading potatoes on the ground appeared to be more practicable than placing them in a vertical crib or in open, horizontal structures above the ground. Spreading potatoes in layers not more than 6-8 in. deep is preferable to spreading them in deeper layers. The best method of using the field-dehydrated potatoes is to let the animals pick up the tubers from the ground.—E.B.O.

168 Findlen, H. **Effect of several chemicals on sprouting of stored table-stock potatoes.** *Amer. Potato J.* 1955, **32,** No. 5, 159-67, bibl. 7, illus. [Agric. Mark. Ser., U.S. Dep. Agric., East Grand Forks, Minn.]

MENA (methyl ester of α naphthaleneacetic acid) applied at the rate of 17 mg. per kg. of potatoes gave excellent inhibition of sprouting in Triumph and Pontiac potatoes at 59°F. (average) for one month. This preparation was more effective when applied in an aqueous wax emulsion than in water. Although this treatment was more effective on unsprouted tubers, it was also satisfactory when applied to desprouted tubers. α chloronaphthalene applied in an aqueous wax emulsion at a concentration of 100 mg. per kg. of potatoes almost completely prevented sprouting, but caused some injuries to the tubers. Maleic hydrazide was ineffective in retarding sprouting when applied to potatoes as an aqueous dip.—From author's summary.

169 Kirkpatrick, Mary E. and others. **Flavor tests on potatoes grown in soil where Lindane was applied to cucumbers.** *Amer. Potato J.* 1955, **32,** No. 7, 259-64, bibl. 7. [U.S. Dep. Agric., Washington, D.C.]

Five potato varieties, Bliss Triumph, Cherokee, Irish Cobbler, Pontiac and Sebago, were grown in fields in which Lindane-treated cucumbers had been grown the previous year. The potato tubers were tested soon after harvest and after 3 months' storage at 55°F. No significant off-flavour was detected in Cherokee and Sebago, whereas flavour scores for the other varieties were lower, to a variable degree, than for tubers grown in untreated plots.—From authors' summary.

170 Jähnl, G. Ergebnisse der Kartoffelversuche des Jahres 1954. [**Results of potato trials in 1954.**] *VersErgebn. Bundesanst. alp. Landw., Admont* 1955, No. 27, pp. 48. [Bundesanst. Alp. Landw., Admont, Austria]

Varietal trials. Trials were conducted at 4 locations, with early and late varieties of potato, to study date of emergence, resistance to *Phytophthora*, and starch content, size and yield of tubers. Of the early varieties, Oberarnbacher Frühe was consistently good. In Lienz, the variety Vera was significantly better than Oberarnbacher Frühe. Of the late varieties, the best were Ackersegen and Agnes. These trials were conducted over several years at 2 locations with 8 early and 1 late variety. Two size-classes of tubers were employed : 6 dkg. and 12 dkg. In each tuber-size class, yields from whole tubers were significantly higher than from crown halves of the same size class. The same mathematical procedure for analysis showed no statistical difference between yields from whole 6 dkg. tubers and from crown halves of 12 dkg. tubers. Recultivation of the same seed stock. From 1950-4, new seed potatoes from Lower Austria and the seed of the original stock were cultivated on the same ground at each of 3 stations. Yields of tubers fell rapidly in subsequent years of cultivation, more rapidly in the early varieties than in the late ones. —D.B.

SWEET-POTATOES

171 Culbertson, R. E. and Boulware, J. H. **Sweet potatoes in Japan.** *Rep. 145. Nat. Res. Sect. Allied Powers H.Q.* 1951, pp. 63, bibl. 82, illus. [Received 1955]

An informative account is given of the present position of sweet-potato growing in Japan and of research on, and suggested methods for, its improvement.—G.M.R.

172 Kodama, T. and Nomoto, T. **Effect of 2,4-D on the growth and yield of sweet potato plant.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1955, **23,** No. 4, 243-4 and 246, English summary. [Kanto-Tosan Agric. Exp. Sta.]

Growth and yield in the sweet-potato (*Ipomoea batatas*) were less unfavourably affected by spraying with 2,4-D when slips were planted vertically or when hardened slips were used, but 2,4-D injury

was more severe when horizontal planting was done or soft slips were used. Susceptibility to injury by 2,4-D was greatest at the planting stage. Weight increase in the top and root was greatest when 2,4-D was applied on the 7th or 14th day after planting.—From authors' summary.

173 VIALE, E. and THOMAS, N. F. Combate del gorgojo del camote *Rhyssomatus* near *subcostatus* (Fabr.). [**Control of the sweet-potato weevil *Rhyssomatus* near *subcostatus* (Fabr.).**] *Turrialba* 1954, **4,** No. 3-4, 135-42, bibl. 6, illus., English summary p. 135. [Inst. Interamer. Ciencias Agric., Turrialba, Costa Rica]

In a field trial to control the weevil *Rhyssomatus* near *subcostatus* on the sweet-potato (*Ipomoea batatas*), Dieldrin, applied to the soil before the sweet-potatoes were planted, as emulsion, suspension or dust, at rates of 25, 40 and 55 g. per 100 sq. m., was best, the average increase in yield from the treated plots being more than 560% over the control.—E.B.O.

174 NAKAMURA, S. and others. **Physiological studies on sweet potato, *Ipomoea batatas* Lam. I. Correlative inhibition of older roots upon thickening growth of the roots, initiated at later stage.** [Japanese] *Bull. Fac. Agric., Kagoshima* 1954, No. 3, 14-20, bibl. 3, English summary.

When a slip of sweet-potato with 7 or 8 fully expanded leaves is planted in soil along its whole length horizontally, more tubers are formed on the apical nodes. When 3 basal nodes of the slip are planted, and, after 17 days, the remaining apical nodes are embedded in soil, the great majority of the tubers formed are confined to the 3 basal nodes. Thus the thickening growth of the roots later initiated on the apical nodes is inhibited by the older, basal roots. If the roots of the basal nodes are dug out and then the slip is planted again horizontally, the inhibitory effect of the older, basal roots can be considerably weakened. —From authors' summary.

175† FRENCH, M. H. **The feeding value of sweet potato tubers.** *E. Afr. agric. J.* 1955, **21,** No. 1, 18-19, [Joint Anim. Industr. Div., E.A.A.F.R.O. and E.A.V.R.O.]

Like the tubers of cassava [*Manihot utilissima*] and edible canna [*Canna edulis* ?], with which comparisons are made, the tubers of sweet-potatoes [*Ipomoea batatas*] are rich in carbohydrates but deficient in crude proteins and minerals. They are succulent, highly digestible, have a starch equivalent of 88 and are valuable in mixed rations. —M.P.

176 YAMAMOTO, Y. and TOMITA, Y. **Studies on the nutritive value of sweet potatoes. 2. A fluorometric method for determining the riboflavin content of sweet potatoes.** [Japanese] *Bull. Fac. Agric., Kagoshima* 1954, No. 3, 114-21, bibl. 15, English summary.

CASSAVA

177† OYENUGA, V. A. **The composition and nutritive value of certain feeding stuffs in Nigeria. 1. Roots, tubers and green leaves.** *Emp. J. exp. Agric.* 1955, **23,** No. 90, 81-5, bibl. 16. [Div. Anim. Nutr., Univ. Coll., Ibadan]

Among the plants used for this detailed study were *Manihot utilissima Xanthosoma saggitifolium, Colocasia esculenta, Ipomoea batatas,* and *Dioscorea* spp. They were valuable sources of carbohydrates, especially cassava, while *Dioscorea dumetorum* was richest in protein. The peels of the roots and tubers are also a valuable source of nutrients for livestock.—M.P.

178 DEPARTMENT OF AGRICULTURE, ZANZIBAR PROTECTORATE. **Annual Report for 1954.** 1955, pp. 31, 2s.

Cassava, p. 10. The Amani varieties 4674/4, 46106/26 and 46106/27 outyielded the local variety Msitu and were more resistant to mosaic disease. —M.P.

ARTICHOKE

179† ROMINSKIĬ, I. R. and GOLOVIN, P. V. [**Fructose—a new industrial sugar.**] *Priroda, Moskva* (*Nature, Moscow*) 1955, **44,** No. 9, 92-4, illus. [Inst. Organic Chem., Acad. Sci., Ukraine SSR]

The merits of *Helianthus tuberosus* as a source of fructose and as stock feed are outlined. In USSR the average harvest of tubers is 20 tons/hectare, but in the Northern Caucasus yields of 150 to 160 tons per hectare have been recorded. The tubers withstand 15° of frost and can therefore be left in the ground during winter and harvested in spring. The development of the fructose industry from this crop in the Ukraine is described.—M.H.

180† KÜPPERS-SONNENBERG, G. A. Beurteilung von Topinamburleistungen. [**Assessment of artichoke efficiency.**] *Saatgutwirtschaft* 1955, **7,** No. 9, 256-8.

The different types of *Helianthus tuberosus* for fodder, food, industrial use, or as a windbreak, are discussed chiefly as regards growth habit (bushy or single-stemmed), earliness and capacity for regrowth of tops after cutting. For use as fodder, the best varieties are those with thick-skinned

tubers of high protein- and carbohydrate-content and with tops which have a high capacity for regrowth and so permit a good second cut in late autumn after the first cut in July. The tops must therefore be frost-resistant. Küppers rote Zonenkugel is given as the type to aim at in developing a fodder artichoke.—D.B.

FIBRE CROPS

COTTON

181† Hakimov, K. and Alieva, Z. [**The production of high yields of lucerne seed in the Karl Marx Collective Farm (Lenin district, Andižansk Province).**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1955, **5,** No. 7, 33-6.

The Andižansk Province is in the Uzbek SSR where an increase in the amount of lucerne seed is necessitated because of the extension of areas under a cotton/lucerne rotation.—M.H.

182 Brown, L. C. and Hyer, A. H. **Chemical defoliation of cotton. 4. Lodging in bottom defoliated cotton.** *Agron. J.* 1955, **47,** No. 8, 378. [U.S. Fld Sta., Sacaton, Arizona]

In field trials in Arizona, the Upland cotton varieties Acala-44 and A × D, and the American-Egyptian varieties Pima S1 and 1-71, were grown at a spacing of 3 in. apart in the row so as to increase the tendency to lodge. The lower one-third of the plants was defoliated when the lower bolls had matured. Defoliation was done either by hand, or by the use of 85% monosodium cyanamide at a rate of 8 lb. per ac. The amount of lodging was recorded on 1 November. Lodging incidence was significantly less in bottom-defoliated cotton, regardless of the method of defoliation, than in non-defoliated controls. The differences between hand- and chemically-defoliated cotton in terms of lodging were not significant. The different varieties responded similarly to the defoliation treatments.—P.J.B.

183 Christidis, B. G. **Dormancy in cotton seed.** *Agron. J.* 1955, **47,** No. 9, 400-3, bibl. 25. [Cott. Res. Inst., Sindos, Greece]

Seed dormancy studies were carried out at the Hellenic Cotton Research Institute, using three varieties, two of which were *Gossypium hirsutum* types and one of which was a selection from a cross *G. hirsutum* × *G. barbadense.* Experimental variables included light or normal irrigation, and three dates of picking, namely : (a) bolls opening from 8-15 Sept., (b) from 1-7 Oct. and (c) from 22-29 Oct. Germination tests were made on seed 3 days after picking, i.e. on 18 Sept., 10 Oct. and 1 Nov., 1948 and on 22 Nov., 1948 and 3 Jan. and 2 April, 1949. The irrigation treatments had no significant effect on seed germination. Variety × date of picking interactions reached a level of significance on one occasion, only, and that was due to abnormal results in the case of one variety. For bolls opening early in the season, about 25 days rest was sufficient to permit satisfactory germination. Bolls opening relatively later needed 40 days rest while those which matured last needed up to 5 months, or more, to germinate satisfactorily. Dormancy effects were relatively less pronounced in the American-Egyptian variety than in the other two. The effect of dormancy on the time taken to spout was more pronounced than on the germination percentage. Seed harvested at the first picking date took nearly twice as long to germinate as that harvested at the last date ; these differences decreased progressively the longer the seed was stored, but were still apparent after 5 months of storage. From these results, it was apparent that the viability of cotton seed shortly after harvest could not be assessed accurately by normal germination procedures.—P.J.B.

184 Foy, C. L. **Effectiveness of isopropyl N-(3-chlorophenyl) carbamate as a selective pre-emergence herbicide in cotton.** *Weeds* 1954, **3,** No. 3, 282-91, bibl. 21, illus. [Fld Crops Dep., Univ. Missouri, Columbia]

Field trials to test the effectiveness of CIPC as a pre-emergence herbicide for cotton were carried out during 1952-3 in south-eastern Missouri on moderately fertile Lintonia sandy loam soil. In trials to compare CIPC with DNOSBP, rates of 5·6·6 lb. DNOSBP and 6·6 lb. CIPC were used. These rates are expressed on an overall basis, though only a band 12 in. wide over the rows was treated. All materials were applied in bands at a spray volume of 12 gal., equivalent to 40 gal. per ac. on an overall basis. Temperature had a direct effect on the activity of CIPC. CIPC vapour was non-toxic, unlike that of DNOSBP, which was reported to have caused considerable injury to cotton in 1952. Volatilization of CIPC became serious at temperatures over 90°F. and reduced its effectiveness for weed control. Best weed control with CIPC was obtained in spring, when ample rainfall shortly after treatment moved the herbicide into the zone of germinating weed seeds. CIPC was consistently superior to DNOSBP for controlling weeds and was the more economical treatment in terms of ultimate effectiveness. CIPC was superior to DNOSBP for controlling grass weeds, particularly *Digitaria* spp., while DNOSBP was relatively better for controlling broad-leaved weeds. CIPC was not effective for controlling *Sorghum halepense, Cyperus rotundus, Solanum carolinense,* or *Ambrosia elatior.* In further trials, the optimum rate for CIPC treatment on this soil type was 6-9 lb. and the residual action lasted 6-8 weeks. CMU was superior to CIPC for controll-

ing weeds, but injured the cotton at rates as low as 1 lb. per ac. and significantly reduced cotton lint yields where 2 lb. per ac. were applied.—P.J.B.

185 IVY, E. E. and others. **Two new phosphate insecticides for cotton insect control.** *J. econ. Ent.* 1955, **48,** No. 3, 293-5, bibl. 5. [Texas Agric. Exp. Sta.]

Bayer 17147, a benzotriazine derivative of a methyl dithiophosphate, was tested under field conditions for the control of the pink bollworm (*Pectinophora gossypiella*) on cotton. It was applied as a 5% dust at the rate of 15 lb. per ac. early in the morning on 10 Sept. This treatment was repeated 6 times at 5-day intervals. The number of injured bolls was significantly lower in the plots treated with Bayer 17147 than in those treated with DDT.—E.B.O.

186 GOODMAN, A. **Apparent stimulation of the growth of X1730A cotton by an insecticide.** *Emp. Cott. Gr. Rev.* 1955, **32,** No. 2, 93-101, bibl. 13.

Following the application, in 1953-4, of 2 lb. DDT per feddan [1 feddan = 1·038 ac.] in 25 gal. water to X1730A cotton, it appeared that sprayed plants were stimulated in growth and fruiting. The sprayed plants were taller, made more fruiting points and opened more flowers than unsprayed plants. In addition there were more leaves on sprayed plants. Similar effects had been noticed after BHC spraying in 1951 and repeated DDT spraying during 1952. The differences noted appeared to be due to direct growth stimulation by the insecticide and not to the diminished vigour of the unsprayed plants.—From author's summary.

187 ARUTJUNOVA, L. and KANAŠ, M. [**Factors which lessen the formation of motes in cotton.**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1955, **5,** No. 8, 43-7. [All-Union Sci. Res. Inst. Cott. Prod.]

In a progressive study, dating from 1940, on the occurrence of motes [aborted ovules] in cotton it has been shown that there are few motes in the *Gossypium arboreum* vars. C-7059 and C-7010. There is no apparent connexion between mote formation and number of valves or the extent of boll opening. There is, however, evidence that mote formation varies, depending on varietal characteristics, from 4·1% [of number of ovules per plant] in the variety C-5406 to 14·8% in the variety 138-F. There is also evidence of a relationship between mote formation and (1) region of crop growth ; (2) seasonal changes in the climate ; (3) cultural conditions of the crop ; and (4) inadequate pollinations. It has been confirmed that intravarietal pollinations ensure the best seed development. Late sowing retards crop development, and leads to an increase in mote numbers. In the tests recorded, the lowest mote numbers were observed in the crops sown on 6 April. It is concluded that a study of cultural measures which are optimal for the cotton variety concerned ensures a lowering of mote numbers. The value, in this connexion, of square-pocket sowings is stressed. —M.H.

188 PROKOŠEV, S. M. and others. [**Organic acids in leaves of the cotton plant.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1955, **102,** No. 5, 985-7, bibl. 4. [A.N. Bach Biochem. Inst., Acad. Sci. USSR]

This study of the leaves from *Gossypium barbadense* and *G. hirsutum* has shown that they contain much citric and malic acids. The utilization of cotton leaves as a source of new and cheap material for obtaining nutrient acids depends entirely on the possibility of substituting economic mechanical defoliation for the present use of chemical defoliants.—M.H.

189 LAUDELOUT, H. and others. La fumure du cotonnier en Uele. [**Cotton manuring in Uele (Belgian Congo).**] *Bull. Inform. INÉAC* 1955, **4,** No. 3, 177-97, bibl. 3.

190 TAVERNETTI, J. R. and MILLER, H. F. **Studies on mechanization of cotton farming in California.** *Bull. 747 Calif. agric. Exp. Sta.* 1954, pp. 33, bibl. 14, illus.

Aspects considered include : high- and low-bed sowing, the use of seed-press wheels, plant populations, continuous drilling versus hill sowing, the use of mechanical thinners, weed control, machine topping, defoliation and the use of mechanical pickers.—P.J.B.

191 EMPIRE COTTON GROWING CORPORATION. **Progress reports from experiment stations. Season 1953-54. Tanganyika Territory, Lake Province.** 1955, pp. 24, illus.

INVESTIGATIONS REPORTED :

1. Yield and sowing-date trial, pp. 6-7. A marked decline in yield ocurred when sowing was delayed until the end of January to early February.
2. Resting crop trial, pp. 7-8. Residual responses were obtained in seed-cotton and millet yields to phosphate, compost and planted fallows. The response to " tumbledown " fallows was less in cotton than millet.
3. Manuring and fertilizers, pp. 8-11. In several trials there were direct and residual responses to phosphate and organic manures. Application of a topdressing of 175 lb. sulphate of ammonia per ac. to plots treated with seed-cotton ash in 1944 (and assumed to be amply supplied with phosphate) unexpectedly increased the yield of seed-cotton 80% above that of the untreated, but top-dressed control plots.

4. Ridge-tying trial, pp. 11-12. At Lubaga, where the soil is shallow and water needs to be conserved, ridge-tying increased yields by up to 400 lb. seed cotton per ac. compared with flat cultivation.
5. Strain trials, pp. 13-15. UK 48 outyielded Mz 561 by an average of 71 lb. lint per ac. in 19 strain trials carried out under a range of conditions and cultivated by the plot holders. In the main trials of the season, UK 48 and UK 51 outyielded Mz 561 by an average of 35%. In the valley trial, where only one small picking, in July, was possible, the increase was just over 11%; in the hill sand trial 30%, and at Lubaga nearly 70%.
6. Treatment of seed against *Xanthomonas malvacearum* pp. 17-20. Sulphuric acid, Perenox, Agrosan and Spergon were of value for cotton seed treatment against bacterial blight on both rotated and trash-infested land. On good, rotated land the mean yield increase was 177 lb. seed-cotton per ac. (i.e. 25%), and on poor, trash-infested land, 126 lb. per ac. (i.e. 29%).—M.P.

192 EMPIRE COTTON GROWING CORPORATION. **Progress reports from experiment stations. Season 1953-54, Tanganyika Territory, Eastern Province.** 1955, pp. 11.

INVESTIGATIONS REPORTED :
1. Spacing and time of planting trial, pp. 3-4. February-sown cotton gave the highest yield of all treatments. Results indicated that spacing closer than 3 ft. × 3 ft., with 2 plants per hole would give increased yields.
2. Seed coat nep, p. 5. Counts of seed showing damaged chalazal tips showed the proportion of such seeds to be below 20% for most strains ; the proportion varied from place to place.
3. Dusting trial on native-grown cotton, pp. 9-10. Plots dusted weekly for 8 weeks with 10% DDT/3% BHC dust at 8 lb. per ac. showed increased yields of seed-cotton over undusted plots; there was also a substantial net profit in the case of well grown cotton.
4. Main conclusions from the insecticidal trials, p. 10. June was shown to be the critical month for bollworm control. Dusting in May and not June, and dusting in July and August only, gave poor control. The DDT/BHC mixture which was most satisfactory was 1 lb. DDT with 0.25 lb. BHC per ac. applied weekly for 8 weeks. Of other insecticides on trial, only Endrin, at 0·25 lb. per ac., proved better than the DDT/BHC mixture ; it was also less costly.—M.P.

193 EMPIRE COTTON GROWING CORPORATION. **Regional Experiment Station, Biloela. Progress report for the season 1953-54. Queensland.** By R. W. Peters, 1955, pp. 16.

INVESTIGATIONS REPORTED :
1. Cotton thinning trials, pp. 3-5. Cotton was sown at 20 lb. per ac. and then thinned by hand, or cross-cultivated with or without hand-thinning. Hand-thinning alone resulted in higher yields than the other methods, whereas additional hand-thinning after cross-cultivation was of no advantage.
2. Irrigated cotton varietal trial, pp. 8-9. Yields were low, but Coker 100 and Stoneville 2B were top-yielders.
3. Dryland varietal trial, pp. 9-10. Empire had the highest overall yield of seed cotton per acre. Locket also yielded well, giving the highest yield of lint per ac.
4. Dryland versus irrigated cotton, pp. 11-12. Irrigated cotton was shorter in height, and earlier in flowering and boll opening than dryland cotton. Contrary to the 1952-3 results, irrigated cotton yielded 300 lb. seed cotton per ac. more than the dryland cotton, in 1953-4.
5. Cotton following soyabeans, pp. 12-13. In the 1952-3 season, the yield of dryland cotton on the station averaged 1530 lb., and in 1953-4, 1000 lb. seed cotton per ac., whereas cotton grown after a crop of soyabeans yielded 2311 lb. and 1482 lb. seed cotton per ac., in the two years, respectively.
6. Irrigated cotton mechanical harvester trial, pp. 13-14. As a result of 3 years' work, Miller 43.9.0, Coker 100, New Mexico Acala and Acala 4.42 appear to be amongst the most suitable varieties for mechanical harvesting.
7. Dryland cotton mechanical harvester trial, pp. 14-15. Maximum overall efficiency of such harvesting, in non-defoliated cotton, can be expected to be about 85-90%. The Miller strains of cotton appear suitable for mechanical harvesting whilst other varieties such as Empire, Coker 100, New Mexico Acala and D & Pl. 14, are best picked by hand.—M.P.

HEMP

194 ABELA, M. M. El cañamo. Trece años de experiencias sobre su cultivo. 1941-1953. [**Thirteen years' experiments in growing hemp. 1941-1953.**] *An. Inst. nac. Invest. agron.* 1955, **4,** No. 1, 1-132, illus. [Cordoba Exp. Sta.]

The experiments were carried out to determine the best varieties of hemp, and optimal cultural technique, under the regional irrigation scheme and similar climatic and soil conditions. Trials comparing Fatsa, a Turkish variety introduced in 1941, with another Turkish and several Spanish varieties demonstrated the superiority of Fatsa from 1946 onwards. In the experimental zone, the best results both in stem and seed were obtained from sowing during the second fortnight in March and, within this period, the earlier the better. So far, broadcasting at the rate of 125-150 kg. per ha., or drilling in rows 25 cm. apart at the rate of

80 kg. per ha., have given the best stem production. The general conclusions from manurial trials are : it pays to manure hemp well, especially the variety Fatsa ; for stem production, nitrogen is essential in the form of ammonium sulphate (300 kg./ha.), dried blood (450 kg./ha.), farmyard manure (30,000 kg./ha.), or Chilean nitrate (150 kg./ha. applied within 3 or 4 weeks of sowing) ; for seed production, nitrogen encourages development of the plant, whilst the addition of phosphates (500 kg. superphosphate per ha.) and potassium sulphate (150 kg. per ha.) encourage ripening. In irrigation experiments, significant results were obtained only in connexion with seed production in 1953, from which it was deduced that, supposing rainfall to be nil, it is advisable to supply from 10,500 to 12,600 $m.^3$ water per ha., in 15-18 applications each of 700 $m.^3$, spread over the months March-September. The best seed yield was obtained from harvesting on 30 September. In general, cutting should not be delayed more than 10-17 days after maturity has set in. No experiments were made to determine the best type of soil for hemp, but the heavy yields and 4 m.-high stands reported were obtained on deep, fertile river silt with a Ca content of 23 to 28%, rather low organic-matter content and relatively high retentive capacity. Detrimental factors encountered were bindweed (*Convolvulus* sp.), birds which attacked the seed, and shading by fruit trees and by a poplar grove which at 20 metres' distance reduced the height of the stand from 4 m. to 0·50 or 1 m.—G.M.R.

JUTE

195 BANERJEE, B. **Jute—especially as produced in West Bengal.** *Econ. Bot.* 1955, **9,** No. 2, 151-74, bibl. 6, illus. [Geogr. Dep., Univ. Calcutta, India]

A review is given of the taxonomy and general characteristics of jute, with particular reference to *Corchorus capsularis* and *C. olitorius*, and of its cultivation and processing for fibre.—P.J.B.

196 KUNDU, B. C. and SARMA, M. S. **Jute seed. 2. Production and distribution of improved varieties.** *Jute Bull.* 1955, **17,** No. 12, 361-3, bibl. 3.

KENAF

197 PLAUT, M. and others. **Experiments on the growing of kenaf (*Hibiscus cannabinus*) in Israel.** *Bull. Res. Coun. Israel* 1955, **4,** No. 4, 388-91, bibl. 6. [Fac. Agric., Hebrew Univ., Rehovot]

From tests on sowing date (6 replications) it is concluded that mid-June is the most suitable time for satisfactory fibre production. Under irrigation (750 $m.^3$ per dunam, at 10-day intervals) [1 dunam = 0·247 ac.], the best spacing is from 30 to 45 cm. between the rows, the distances within the rows being 2-3 cm.—M.H.

198 SEALE, C. C. and others. **The effect of date of planting and age at harvest on the yield and quality of kenaf fiber in south Florida.** *Turrialba* 1954, **4,** No. 3-4, 125-30, bibl. 11. [Fla Univ., Everglades Agric. Exp. Sta.]

Results are given from trials with kenaf (*Hibiscus cannabinus*) variety El Salvador grown on peat or on sandy soils in south Florida, in 1950-1. The fibre percentage did not increase significantly after 100 days from sowing, and the fibre yield per plant did not increase after 125 days from sowing.The plants reached their maximum height at 150 days from sowing. At Everglades on peat soil, both the percentage and the yield of fibre showed a marked and significant decrease with sowing at the end of July, compared with earlier sowings. At Immokalee on sandy soil, instead, this decrease occurred with sowing at the end of June. The strength and shear of the fibre differed significantly with age at harvest ; the highest values were obtained 100 days after sowing. In general, the quality of the fibre decreased with later sowing dates. Retted fibre had significantly higher quality values than decorticated fibre, and these values were somewhat higher on sandy soil. [See also *Fld Crop Abstr.* 6 : 1086.]—E.B.O.

HIBISCUS

199 COHIC, F. L'erinose de l'*Hibiscus*. [**"Erinose" of *Hibiscus*.**] *Rev. agric., Nouv.-Calédonie* 1954, **5,** No. 9-10, 13-15. [Inst. Fr. d'Océanie]

A serious disease of *Hibiscus* [species not stated], caused by the mite *Eriophyes hibisci*, is reported in the Noumea region, New Caledonia. As a control measure, it is recommended that the crop be sprayed with Parathion, Pestox 3, wettable sulphur, or other named preparations, at an early stage of infection. In advanced stages, the affected parts of the plants should be cut off and burnt, and treatment given to the stems and re-growth.—E.B.O.

OIL CROPS

SESAME

200 OLIVE, F. R. and CANO, J. G. Efectos de varios espaciamientos en la producción de diferentes tipos de ajonjolí. [**The influence of various spacings on the yield of different types of sesame.**] *Turrialba* 1954, **4,** No. 3-4, 143-6, bibl. 6, English summary p. 143.

[Cent. Nac. Agron., Santa Tecla, El Salvador]

Plot trials were conducted in 1952-3 with the sesame varieties Venezuela 51, which has one central stem only, Venezuela 52 with few branches and Criolla with many branches. The row widths tested were 30, 60 and 90 cm.; the spacings between hills 10, 20 and 30 cm.; the number of plants per hill 1, 2 and 3. The row width of 30 cm. gave the highest yields. Highly significant differences in yield were obtained according to varieties. Venezuela 52 yielded best in 1952 but Venezuela 51 yielded best in 1953. Criolla gave the lowest yields in both years. The different spacings between hills and the different numbers of plants per hill gave similar yields.—E.B.O.

201 MAZZANI, B. Contribución de las variedades de ajonjolí creadas por el MAC. [**Varieties of sesame bred by the Venezuelan Ministry of Agriculture.**] *Agricultor venezol.* 1955, **19,** No. 177, 12-15 and 19, illus.

The breeding of new varieties of sesame from 1945 onwards has aimed at removing the chief disadvantages of the native varieties, namely, an over-long life cycle necessitating early sowing, and excessive vegetative growth which makes mechanical harvesting difficult. This has been achieved in the varieties Venezuela 51, Venezuela 52, Acarigua, Morada, and Inamar, which enable the growing of sesame to be extended to new parts of the country. An account of the 5 varieties and their origin is given.—G.M.R.

202 GHOSH, B. N. **Photoperiodic response in til (*Sesamum indicum* Linn.).** *Curr. Sci.* 1955, **24,** No. 5, 170, bibl. 5. [State Agric. Res. Sta., Chinsurah, Hooghly]

An early sesame variety (Jinardi) and a medium-late variety (Goghat) were exposed, from 10 days after sowing, to short photoperiods of 7 and 9 hr. for 4, 5, and 6 weeks' duration. Results are tabulated and show that the short photoperiods induced acceleration of flowering of the main shoot as well as the branches, together with a reduction of vegetative growth as indicated by plant height, number of branches and leaf number. A marked decrease in growth was noted in the medium-late variety, in which the effect of short photoperiods was more pronounced than in the early variety. The leaves of the control plants were much bigger, with middle leaves serrated and lobed trifoliately, while those of the treated plants were entire, with no trifoliation. In both varieties, the number of capsules was increased by short days.—G.M.R.

SAFFLOWER

203 KNOWLES, P. F. **Safflower — production, processing and utilization.** *Econ. Bot.* 1955, **9,** No. 3, 273-99, bibl. 129. [Agron. Dep., Univ. California, Davis]

Aspects reviewed include: distribution, botany, adaptation, cultivation practices, diseases and utilization.—P.J.B.

SUNFLOWER

204 BUGUEÑO, V. V. Influencia de tamaño de semilla y profundidad de siembra en el rendimiento de granos en maravilla. [**Influence of size of seed and depth of sowing on the yield of sunflower seed.**] *Agric. Tec., Santiago* 1954, **14,** No. 1, 27-46, bibl. 4, illus., English summary p. 46. [Minist. Agric. Chile]

Klein seed was sown at depths of 3, 8, 13 and 18 cm. in 1951. Seed size did not affect germination or yield. Relatively large seeds gave more vigorous plants in the early stages of development than did relatively small seed; the difference disappeared in the later stages. Depth of sowing influenced emergence and plant vigour. Yields of seed at 3, 8, 13 and 18 cm. were 18·34, 18·56, 18·12 and 2·21 quintals per ha. The recommended depth of sowing is 6 cm.—W.J.B.

CRAMBE ABYSSINICA

205 MAZZANI, B. Introducción de plantas oleaginosas nuevas para Venezuela. II. *Crambe abyssinica* Hochst. [**Introduction of new oil plants into Venezuela. 2. *Crambe abyssinica.***] *Agron. trop., Maracay* 1954, **4,** No. 2, 101-4, bibl. 6, illus. [Cent. Invest. Agronómicas, Maracay, Venezuela]

Seed of *Crambe abyssinica* from Weibullsholm, Sweden, was sown at Maracay (lat. 10°N, altitude 450 m.) and at Araure, in both of which places it developed, flowered and fruited normally, in contrast to *Brassica napus* var. *oleifera* and *B. campestris* var. *oleifera*, which after 7 months failed to flower. The Maracay plants of *C. abyssinica* grew to a height of 93 cm., reached full maturity in 93 days, and gave an average seed yield of 18 g. per plant. The moisture content of the fruit was 7·8%, oil content of the fruit was 29·4% and that of the seed 42·8%. The oil iodine index was 84·3. No trouble was experienced from pests or disease, and harvesting was facilitated by the leaves falling when the plants were mature.—G.M.R.

GENERAL

206 KARTHA, A. R. S. and others. **Rapid estimation of yield and iodine value of oils in small**

samples of oilseeds. *Indian J. agric. Sci.* 1955, **25,** No. 1, 79-84, bibl. 8. [Indian Agric. Res. Inst., New Delhi]

A method is described whereby the yield and iodine value of oil in a 0·3-0·5 g. specimen of seed can be determined simultaneously in about 2 hr. The method is based on the use of carbon tetrachloride as a solvent. Yield of oil is determined gravimetrically and iodine value by Hanus' method. Determination of iodine values of small specimens of oil (10-100 mg.) by a gravimetric bromine vapour absorption method showed that this technique is not quite suitable for the determination of iodine value of oils and fats under the experimental conditions studied.—Authors' summary.

207 SMITH, A. K. **Isolation and utilization of vegetable proteins.** *Econ. Bot.* 1954, **8,** No. 4, 291-315, bibl. 161. [North. Util. Res. Br., Peoria, Illinois]

A review is given of the extraction and uses of protein from cotton seed, soyabeans, linseed, groundnuts, and safflower (*Carthamus tinctorius*).—P.J.B.

OTHER CROPS

208 WHITE, P. L. and others. **Nutritive values of crops. Nutrient content and protein quality of quinoa and cañihua, edible seed products of the Andes mountains.** *J. agric. fd Chem.* 1955, **3,** No. 6, 531-4, bibl. 22. [Departments de Nutrición, Ministerio de Salud Pública y Assistencia Social, Lima, Peru]

Quinoa (*Chenopodium quinoa*) and cañihua (*Ch. pallidiculae*) have been grown for centuries in Peru, mainly at altitudes above 8000 ft. a.s.l. The plant grows to a height of 4-6 ft., is resistant to disease and frosts, requires little moisture and will grow on land which cannot support cereals. Average yields of quinoa, using primitive methods of culture, are reported as 440-800 lb. per ac., but yields of 4400 lb. per ac. have been reported under experimental conditions. The experiments reported in this paper were designed to study the nutritive value of quinoa and cañihua in feeding trials with rats and to determine the amino-acid content of their proteins. The composition of cañihua seed was 14·1% protein, 4·1% ether extract, 10·7% fibre and 4·6% ash ; for quinoa, respective values were 11, 5·3, 4·9 and 3%, on a basis of 12% moisture content in the seed. The amino-acid content of the protein of quinoa and cañihua compared well with that of cereals and the seed had higher contents of protein, ether-extract, Ca, Fe and of the B vitamins than the cereals. The protein quality of the seed of both species was comparable with that of whole, dried milk ; in feeding studies with rats, it was confirmed that the protein was of high biological value. It was thought that these two species were of value as supplementary sources of protein for human nutrition.—P.J.B.

LAND USE, SURVEYS AND MANAGEMENT

209 BLETON, C. L'agriculture en Chaouïa. [**Agriculture in Chaouia (Morocco).**] *Terre maroc.* 1955, **29,** No. 308, 249-52.

210† TOWN AND COUNTRY PLANNING. **The scare about food-growing land.** *Town Ctry Plann.* 1954, **23,** No. 128, 607-10, illus.

The author claims that serious injury is being done to British housing standards by organized propaganda to the effect that urban development is absorbing an excessive amount of agricultural land. It is stated that the commonly quoted figure of 50,000 acres lost to British agriculture each year through housing development is incorrect and that in the 20 years 1951-71 the figure will average approx. 25,000 acres per year. [See *Fld Crop Abstr.* 7 : 1353.]—A.G.G.H.

211† VINK, A. P. A. Landclassificatie. [**Land classification.**] *Landbouwk. Tijdschr., Wageningen* 1955, **67,** No. 6, 377-89, bibl. 19, English summary p. 388.

Methods of classifying land according to its potential crop-bearing capacity are discussed.—W.J.B.

212† CALTON, W. E. and others. **A study of the more important soils of Zanzibar Protectorate.** *E. Afr. agric. J.* 1955, **21,** No. 1, 53-60, bibl. 4, illus. [Dep. Agric. Zanzibar]

Included in this study of the soils of Zanzibar and Pemba islands is the problem of land utilization. The fertility and use of each soil type are discussed briefly.—M.P.

213† GOMEZ, J. A. Algunos problemas de tenencia y uso de la tierra en Colombia. [**Some problems of land tenure and use in Colombia.**] *Acta agron., Palmira* 1955, **5,** No. 2, 67-115, bibl. 45, English summary pp. 112-13.

214† ORLOVSKIĬ, N. V. [**The Altaĭ—a new area for utilization.**] [Russian] *Priroda, Moskva* (*Nature, Moscow*) 1955, **44,** No. 8, 35-46, illus.

Following an outline of the climate, vegetation zones and topography of this region, there is an account of the crops grown and of measures for developing agriculture in uncropped areas.—M.H.

215† KUZNECOV, G. [**Land planning in new areas**

of Kazahstan.] [Russian] *Soc. seljs. Hoz.* (*Social. Agric.*) 1955, **26,** No. 3, 97-103.

216† Pascoe, E. A. C. **Aspects of planning for agricultural development in North Borneo.** *Trop. Agric. Trin.* 1955, **32,** No. 3, 170-85, bibl. 9.

The article treats with the present situation and possible future development of rice cultivation, soil problems, mechanization, cash crops and livestock. The view put forward is that an improved communication network should be developed in order to advance the agricultural, economic and nutritional status of the people of North Borneo.—M.P.

217† Colonial Office. Directorate of Colonial Surveys (Geodetic and Topographical). **Annual Report for year ending 31st March, 1955.** 1955, pp. 19, maps 2, London ; H.M. Stationery Office, 3s.

Part 2 of this report contains brief details of the work carried out for 25 territories, mainly field surveys, air photography and mapping.—A.G.G.H.

218† Prothero, R. M. **The Sample Census of Agriculture, Nigeria, 1950-1.** *Geogr. J.* 1955, **121**, Pt. 2, 197-206.

A limited analysis is made of the techniques and results obtained in the Sample Census of Agriculture for Nigeria, carried out in 1950-51 in response to a request by FAO for information for inclusion in the World Census of Agriculture.—P.J.B.

219† Isbell, R. F. **Survey of the Nebo-Collinsville region [of Queensland].** *Tech. Bull. 4. Bureau Invest. Dep. Public Lands, Brisbane* 1954, pp. 55, maps 2, bibl. 7 in text, illus. [Received August, 1955]

The region under consideration covers an area of 6500 sq. miles in the 20-30 in. rainfall zone of Queensland. The geology, climatology, soil, land and vegetation characteristics are outlined. The pastoral and agricultural potentials of the region are summarized. The prospects of developing irrigation are not encouraging as the water-resources are considered to be small. A reconnaissance soil and land classification map is included.—M.P.

220† Helburn, N. **A stereotype of agriculture in semi-arid Turkey.** *Geogr. Rev.* 1955, **45,** No. 3, 375-84, illus. [Montana State Coll., Bozeman]

The agriculture of semi-arid central Anatolia is highly uniform and is described in this paper by means of a stereotype—a composite or typical village. This stereotype is summarized in terms of the five functioning forms of Whittlesey to give a simple classification of central Anatolian agriculture.—P.J.B.

221† Tonnard, V. L'aide pratique apportée par les photos aériennes. [**The practical value of aerial photographs.**] *Bull. Inst. agron. Gembl.* 1955, **23,** No. 3, 336-51, bibl. 26, illus. [Lab. Géol. et Géogr. Physique]

222 Korol, N. **Agriculture in the zone of perpetual frost.** *Science* 1955, **122,** No. 3172, 680-2.

The problems of crop production in the perpetual-frost zone of north Russia are discussed, with particular reference to the characteristics of the soils in these regions.—P.J.B.

FARMING SYSTEMS AND PRACTICES

223† Schaeffler, H. Bodenfruchtbarkeit als Standortsproblem. Ergebnisse langjähriger ortsfester Fruchtfolge- und Dauerdüngungsversuche auf Braunerden. Mitteilung I. [**Soil fertility as a habitat problem. Results of several years' rotation- and continuous-manuring trials on the same brown earth site. Communication No. 1.**] *Z. Pflbau* 1955, Sonderheft 6, 1-61, bibl. 44, illus. [Bay. Landesanst. Pflbau u. Pflsch., München, W. Germany]

This first report gives results of 26 years of manuring trials with organic manures and complete mineral fertilizer applied separately to the following crops : root crops (fodder- and sugar-beet, potatoes) ; grain crops (wheat, oats, barley, rye, maize) ; field beans and poppy ; fodder plants (red clover, Italian ryegrass, silo maize). 28 tables show the effect of these manures over many years on : the yield by weight ; quality as regards grain/straw ratio, chemical content, and weight per hectolitre of the grain and seed-bearing crops ; the quantities of nutrients supplied to and withdrawn from the soil ; and on the abundance of individual weed species.—D.B.

224† Kibasov, P. [**Strip cropping—a reliable means of increasing yields in Siberia.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 6, 53-7.

The relative merits of *Sinapis alba, S. juncea, Camelina sativa* and *Helianthus annuus* for conserving the snow cover in areas of Western Siberia are outlined. *S. juncea* is considered to be the most satisfactory. Tests were made in the Omsk Province in 1954 with strip crops of *S. alba, S. juncea, H.*

annuus, *Zea mays*, *Setaria italica* and *Sorghum sudanense*. Of these, maize and Sudan grass proved unsuitable for the Omsk area. Good results were obtained with (1) *S. juncea*, (2) *H. annuus* and (3) *S. italica* in the steppe and forest/steppe zone of the Omsk Province when sown as follows : (1) about 10-20 July ; (2) 25 June ; (3) 20 June-5 July. The work contains information on cultural measures.—M.H.

225 BYKOVEC, A. G. [**Mixed sowings of oats and spring wheat with peas.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 4, 51-5.

226 MITROFANOV, A. S. [**Vetch/oat mixture in the non-chernozem belt.**] [Russian] *Zemledelie* (*Agriculture*) 1955, **3,** No. 4, 56-9.

227 LAWRENCE, E. N. **Effects of a wind-break on the speed and direction of wind.** *Met. Mag., Lond.* 1955, **84,** No. 998, 244-51, bibl. 8, illus.

The influence on wind of the two artificial barriers examined may be compared with that of natural shelter-belts of trees and shrubs of similar density. —From introduction.

228† GLOYNE, R. W. **Some effects of shelter-belts and wind-breaks.** *Met. Mag., Lond.* 1955, **84,** No. 999, 272-81, bibl. 47.

This is a review article. Among aspects dealt with are some biological consequences of shelter-belts and wind-breaks.—C.L.S.

229† STANER, P. Les paysannats indigènes du Congo belge et du Ruanda-Urundi. [**The native peasantry of the Belgian Congo and Ruanda-Urundi.**] *Bull. agric. Congo belge* 1955, **46,** No. 3, 467-558, bibl. 44, illus.

The plans for the economic and social development of the Belgian Congo and Ruanda-Urundi include the formation of a native peasant class with a view to replacing an extensive, unorganized agriculture, which entails the destruction of natural resources, by intensive agriculture in which the productivity of the soil is preserved. The formation of this native peasantry, which is still in the experimental stage in many areas, is examined separately for different regions in relation to local farming systems.—E.B.O.

SOIL AND WATER CONSERVATION

230 CAMERON, D. G. **Vegetation in soil conservation.** *J. Soil Conserv. N.S.W.* 1955, **11,** No. 3, 115-24, bibl. 1, illus.

Soil conservation studies at Wagga, Cowra, Wellington and Gunnedah Research Stations are reported. In run-off and soil-loss experiments, carried out in 1949-54, various rotations, cultural practices and pastures were compared, as well as the effect of several grazing intensities in hilly areas. Results indicate the necessity of a soil-building pasture phase after 3-5 years of cropping. Soil loss was 138 times greater from a stubble mulch and 26 times greater from a wheat/fallow rotation than from permanent pasture. The value of under- rather than over-stocking, maintenance of soil fertility and soil protection are emphasized. —M.P.

231† NEWMAN, J. C. **Tumut Catchment area—survey of vegetation and erosion. Part 4.** *J. Soil Conserv. N.S.W.* 1955, **11,** No. 3, 146-62, illus.

[See also *Fld Crop Abstr.* 8 : 1041 and 1434.]

Further vegetational alliances are described. Consideration is also given to the vegetation/water relationships of the plant communities in the area and to the siltation and types of erosion occurring there.—M.P.

232 KURUP, P. G. **Growing *Calopogonium mucunoides* as a solution to soil erosion on the West Coast [of India].** *Madras agric. J.* 1954, **41,** No. 12, 416-20, illus.

The use of *C. mucunoides* as a means of preventing erosion on plantations in south-west India is described. The crop is notable for its rapid production of a thick cover of vegetation during the monsoons. During the dry season it ceases to grow and does not compete with the plantation crop for water. It re-establishes itself each year from self-sown seeds.—W.J.B.

WEEDS, WEED CONTROL AND WEEDKILLERS

233 STRYCKERS, J. and SLAATS, M. Herbiciden tegen *Agropyron repens* P.B., kweekgras. [**Herbicides against *Agropyron repens*, couch or quack grass.**] *Meded. LandbHogesch., Gent* 1954, **19,** No. 3, 423-50, bibl. 11, illus., English, French and German summaries pp. 447-50.

The trials reported were carried out on plots of sandy loam soil, infested with *A. repens*. Herbicides and rates per ha. included : 5, 10, 20 or 40 kg. IPC (active material) applied as spray or dust, $NaClO_3$ at 50 or 100 kg. applied as a spray, or CMU at 1, 2, 5, 10, 20 or 40 kg. as a spray. The treatments were applied during the winter of 1952-3. With IPC, the best kill of *A. repens* followed treatment with 40 kg. per ha. in the form of a wettable powder. Sodium chlorate gave initially good results, but with the resumption of the growing season, *A. repens* rapidly re-established itself. The best results with TCA followed late winter treatments (28 Feb.) with amounts as low as 28 kg. per ha. One year later, *A. repens* stands on these plots were still very small and much smaller than those where 100 kg. NaTCA were applied on 17 Oct. CMU gave the best kill of *A. repens*. Treatment with 5 kg. CMU per ha. resulted in almost complete control. Plots treated with as little as 2 kg. CMU per ha. showed almost no regrowth of *A. repens* 1 year later. To determine the effects of these herbicides on subsequent crops, *Trifolium incarnatum* was sown on 28 August, 1952, maize for silage was sown on 12 May, 1953 and winter wheat was sown on 16 Oct., 1953. *T. incarnatum* tolerated up to 10 kg. IPC per ac. applied at the 4- to 6-leaf stage. IPC was relatively more injurious to the clover, while 25 kg. TCA per ac., sodium chlorate and all rates of CMU were very injurious. Maize sown 20 months after TCA and sodium chlorate treatments was not injured ; where sown 20 months after applications of 40 kg. IPC per ac., it showed some leaf chlorosis. Only where as little as 1 kg. CMU per ha. was applied 4 months before sowing maize, was growth satisfactory. Amounts of 10 kg. CMU per ha. resulted in almost complete failure of maize sown 7 months later. Winter wheat grew successfully after applications of IPC, TCA and $NaClO_3$. Applications of 5 kg. CMU per ha. resulted in risk of damage to the crop when sown 1 year later. In further trials to determine the tolerance of other crops to herbicides, fodder-beet was not apparently injured by pre-emergence treatments with IPC or NaTCA. Applications of 1 kg. CMU per ha. resulted in leaf chlorosis and stopped growth a few months after treatment. IPC was highly effective against *Polygonum* spp. TCA was effective against *Polygonum* spp. and *Matricaria chamomilla*. With flax, amounts of 3 kg. IPC per ha. were very injurious, whether applied pre-emergence, or when the crop was 10 or 20 cm. high. TCA was not practicable for use on flax. CMU at 0·5 kg. per ha., applied to flax 10 cm. high resulted in excellent weed control, though stands and yields were reduced somewhat. There were grounds for regarding CMU as worthy of further trial for flax. —P.J.B.

234 ABEL, A. L. **Couch grass under control.** *Fmr's Wkly, Lond.* 1955, **43,** No. 12, 83-5, illus.

Couch (*Agropyron repens*) can be controlled by two applications, each of 20 lb. TCA per acre, at an interval of 4-6 weeks in the autumn, followed by cultivations. Notes are given on the cropping to be followed after treatment.—C.L.S.

235 THURSTON, Joan M. **Weed studies. Germination and dormancy of wild oat seeds.** *Rep. Rothamst. exp. Sta. 1954* Harpenden, 1955, 67-9.

The cultivation trials were discontinued in 1954 and the area dug over in March and September, 1954. Total germination of the seed, since it was sown in 1950, was 20% for *Avena fatua* and 16% for *A. ludoviciana*, whereas seed which had been stored in the laboratory since 1950 showed in January, 1954, 72% and 86% viability, respectively, Winter cereals again reduced the growth of wild oats, but the inverse relationship between the number of wild oats germinating and the weight of the cereal crop at the time was not apparent in 1954. Results from pot experiments show that early sowing and establishment of the crop may be effective in reducing the seed production of wild oats in spring cereals. Warm conditions, either alternating or continuous, increased the percentage of viable *A. fatua* seeds that were dormant from 66% to 90%. The inhibition of germination of *A. ludoviciana* seed at 27°C. could be overcome by cooling to 5°-10°C., but not by drying and re-wetting. From plants of similar age and size, seeds were removed from the top or bottom halves of the panicles. The remaining seeds were collected when ripe and their germination tested and compared with that of the ' top ' or ' bottom ' seeds of intact panicles. Results indicated that removal of parts of the panicles, as might occur if attempts were made to control wild oats by cutting off the inflorescences above the cereal crop before the emergence of the cereal ears, had no effect on the dormancy of the remaining seeds of *A. fatua*, but increased the percentage of ' first ' seeds of *A. ludoviciana* germinating within 10 weeks of sowing. Removal of the ' first ' seeds of the spikelets at an early stage of their development [by removal of the ovaries] reduced the dormancy of

the ' second ' seeds to about the same percentage as of ' first ' seeds in intact spikelets.—M.P.

236† NAUDÉ, C. P. **Quick-grass control.** *Sci. Bull. 358. Dep. Agric. S. Afr.* 1955, pp. 10, bibl. 4.

In trials at Vaalhartz and Zebediela, quick-grass [*Cynodon* sp.] was successfully controlled by applications of a TCA 90 solution at rates of 337-450 lb. TCA 90 per morgen [1 morgen = 2·116 ac.]. After 6 months all harmful effects of the herbicide had disappeared from the soil. TCA 90 damages lucerne and cannot therefore be used against quick-grass growing in a lucerne sward.—M.P.

237† LOUIS-MARIE (Père). La linaire vulgaire dans le Québec, Canada. 1. 2. Un contrôle entomologique spontané. [***Linaria vulgaris* in Quebec, Canada. 1. 2. Spontaneous entomological control.**] *Rev. Oka* 1955, **29,** No. 2 and 4, 29-32 and 81-3, bibl. 24.

Information, derived mainly from recent literature on the subject, is given on the genus *Linaria* in North America, especially *L. vulgaris* which, although self-sterile, has become a noxious weed in western Canada and the western and central regions of the USA. In Quebec and the eastern regions of the USA, *L. vulgaris* is present, but is not spreading and is not generally considered a noxious weed. Observations indicate that in these regions the spread of *L. vulgaris* is checked by insects which attack its fruits or seeds.—E.B.O.

238 OBORN, E. T. **Control of aquatic weeds that impede flow of western irrigation waters.** *Weeds* 1954, **3,** No. 3, 231-40, bibl. 19. [U.S. Dep. Interior, Bureau Reclam., Engng Labs, Denver, Colorado]

Current research on the following aspects of the control of aquatic weeds in the south-western States of the USA is reviewed : the biological and chemical control of submersed aquatic weeds, aquatic weeds as green manure, the biological and chemical control of emergent aquatic weeds, the tolerance of crops to irrigation water containing herbicides and studies of herbicidal action on aquatic weeds, using radioactive 2,4-D.—P.J.B.

239† DUNK, W. P. and TISDALL, A. L. **Weed control in irrigation channels and drains. Progress report and summary of experimental results, June, 1953.** *Tech. Bull. 5. State Rivers and Water Supply Comm., Victoria* [n.d.], pp. 31, bibl. 11, illus. [Received April, 1955]

Trials with numerous chemicals were carried out in Victoria in 1951-2 and 1952-3 for the control of weeds obstructing drains, channels and natural waterways. The trials took place under practical field conditions and only large, clear-cut differences resulting from the treatments were recorded. The costs involved were taken into consideration and compared with the different mechanical methods at present in use. As a result of the 2 years' experimentation the following control measures are recommended as effective and economical. (1) For cumbungi, *Typha angustifolia*. EF 980M at 12 lb. 2,4-D a.e. in 200 gal. water per ac. (in pasture districts only, because of its volatility) ; elsewhere, Weedone 57 L.V. should be applied at the same rate, when the plants are young and growing vigorously, i.e. mid-November to mid-January, and when the water is less than 12 in. deep. (2) For rushes, *Juncus articulatus* and *Eleocharis acuta*. 6 lb. 2,4-D a.e. per ac. as 1 pt. Weedone 57 per 13 gal. water applied at 150 gal. per ac. This gave a complete kill. (3) For submersed weeds, *Potamogeton* spp., *Myriophyllum elatinoides* and *Vallisneria spiralis*. Petroleum naphthas containing 95% and 64% aromatics added to flowing water at the rate of 600 ppm. over 1 hour. This method is effective but costly and success may depend on the temperature and flow of water. (4) For water milfoil, *Myriophyllum propinquum*. 4 lb. a.e. 2,4-D amine in 150 gal. of water per ac. resulted in complete kill of mature plants when applied to plants which were emergent, in still water, and growing vigorously. (5) For button weed, *Cotula coronopifolia*. A spring, or early summer application of 3 lb. a.e. 2,4-D amine per ac. (6) For *Azolla filiculoides*. Diesel distillate applied at 50-100 gal. per ac. of weed. (7) For willows, *Salix babylonica* and *S. fragilis*. Spraying a 13% wt./vol. solution of an oil-based ethyl ester of 2,4-D on to cut frills in the trunk at the rate of 1 fluid oz. per 20 sq. cm. cross-section of trunk, followed by annual re-treatments with a 5% solution until the trees are killed. Control of water couch grass, *Paspalum distichum*, by chemical means was found to be very costly.—M.P.

240† DUNK, W. P. and TISDALL, A. L. **Weed control in irrigation channels and drains. Progress report and summary of experimental results, June, 1954.** *Tech. Bull. 8. State Rivers and Water Supply Comm., Victoria* [n.d.], pp. 32, bibl. 4, illus. [Received April, 1955]

The trials with chemical herbicides on control of weeds in irrigation channels in Victoria were continued in 1953-4. The work confirmed the results obtained and the recommendations made in the previous years [see Abs. 239] for the control of rushes, submersed weeds, water milfoil, button weed (*Cotula coronopifolia*), *Azolla* sp. and willows. Control of cumbungi (*Typha angustifolia*) is usually also effective with 6 lb. acid equivalent 2,4-D in 37·5 gal. water per ac. Water couch grass, *Paspalum distichum*, can be controlled by applying 50, 100 or 200 lb. of 80% CMU per ac. in winter, or 70 lb. a.e.

Na salt of 2,4-D per ac. *Paspalum dilatatum* can be controlled with 200-400 gal. Na TCA per ac. These last 2 weeds are, however, very costly to eliminate and the methods are uneconomical for large scale use. Cane grass (*Phragmites communis*) appears to be controlled effectively either by repeated and heavy applications of the ethyl ester of 2,4-D or heavy treatments with Na TCA. Precautions to be observed when spraying the hormonal herbicides are given with supporting experimental volatility data.—M.P.

241 GOPAL, R. **Chemical control of weeds.** *Indian Fmg* 1955, **4,** No. 10, 23-5, bibl. 6.
A table is presented showing the appropriate herbicides for the control of numerous Indian weeds. The vernacular as well as the scientific and common English names of the various weeds are given.—W.J.B.

242 CARPENTER, K. **The early spray catches the weed.** *Fmr's Wkly, Lond.* 1955, **43,** No. 13, 83-4, illus.
An account is given of the first year's practical field results with MCPB.—C.L.S.

243 THIEGS, B. J. **The stability of Dalapon in soils.** *Down to Earth* 1955, **11,** No. 2, 2-4, bibl. 6.
Applications of 50 ppm. concentrations of Dalapon were made to Munuscong sandy loam, Miami silt loam and Nappanee clay loam, held at temperatures of 40, 60 and 80°F. At 40°F., there was little loss of Dalapon over an 8-week period. At 60°F., considerable decomposition of Dalapon occurred over the last 4 weeks of an 8-week period. At 80°F., Dalapon disappeared from the soils in 3-4 weeks. In a second experiment, the 3 soils were maintained with moisture contents ranging from 6-11% or 20-27%, at a temperature of 100°F. The Dalapon had almost entirely disappeared from the moist soils in 4-5 weeks, while in the dry soils, much of the original Dalapon still remained after 14 weeks. The addition of peat and dung increased the rate of disappearance of Dalapon from the soils. There was evidence that Dalapon is utilized in soils by micro-organisms which grow slowly in numbers after an initial Dalapon treatment, but which are therefore able to decompose subsequent applications of Dalapon relatively more rapidly than after the initial treatment.—P.J.B.

244 OGLE, R. E. and WARREN, G. F. **Fate and activity of herbicides in soils.** *Weeds* 1954, **3,** No. 3, 257-73, bibl. 27. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]
The results are reported on the fate and activity of 2,4-D,*n*-1 naphthylphthalamic acid (NPA), TCA, CMU and CIPC in different soils, as affected by breakdown due to temperature, leaching and percolation. In most cases, CMU was the most persistent, followed by TCA, CIPC, NPA and 2,4-D, in that order. TCA moved downward most rapidly in all soils, while CIPC in all soils, and CMU in organic soil, were very resistant to movement.—P.J.B.

245 HEBBLETHWAITE, P. **A tentative method for investigating the influence of application rate on the penetrative power of herbicide sprays.** *J. Sci. Fd Agric.* 1955, **6,** No. 10, 582-4, bibl. 4. [Agric. Test. Dep., Nat. Inst. Agric. Engng, Silsoe, Bedfordshire]
A method suitable for investigating the penetration of herbicide spray into ground-crop foliage is presented. Under the conditions of the trial, a high-volume application resulted in a greater retention of spray at the level of the weeds than did a low-volume application.—From author's summary.

246† PFEIFFER, R. and others. **A variable dosage sprayer for agricultural experiments.** *Nature, Lond.* 1955, **176,** No. 4479, 472-3. [Chesterford Park Res. Sta., Near Saffron Walden, Essex]
The present method for testing in the field the toxicity and selectivity of herbicides or other spray chemicals necessitates spraying a number of separate plots with different dosages. The authors have designed a machine which makes it possible, with one filling, to spray with continuously decreasing concentrations, starting from an arbitrary upper limit.—M.H.

247 RIEPMA Kzn, P. De reactie van granen en peulvruchten op kleurstoffen. **The reaction of cereals and pulse crops to dinitros.** *Meded. LandbHogesch., Gent* 1954, **19,** No. 3, 451-6. [C.I.L.O., Wageningen, Neth.]
Data are given showing the yield increases caused by DNOC treatments made to winter wheat, rye and peas, grown in weed-free plots. The reasons for these yield increases are discussed.—P.J.B.

248 FEEKES, F. H. and ZWIJNS, M. J. Proeven met vernevelbaar DNC (dinitro-orthocresol producten) voor selectieve onkruidverdelging, winter-bestrijding in de fruitteelt en bestrijding van de lariksmot (*Coleophora laricella* Hb.). [**Atomizing experiments with DNC (dinitro-ortho-cresol products) for selective weed killing, fruit-tree spraying in winter and controlling the larix moth (*Coleophora laricella*).** *Meded. Landb-Hogesch., Gent* 1954, **19,** No. 3, 464-503, bibl. 9, English summary pp. 476-8.[N.V. Fabriek van Chem., Vondelingplaat, Neth.]
The results are given of extensive trials to compare low- and high-volume treatments of oats, spring

barley and winter barley, winter wheat, spring rye, linseed and flax with a number of DNOC compounds. These compounds included 3 organic salts of DNOC, an organic salt containing an additional 10% of DNOC free acid, a paste formulation containing 25% DNOC free acid equivalent (Tripastide) and a wettable powder containing 50% DNOC free a.e. (Triacide), and ammonium DNOC. Spray volumes used were 100 and 1000 l. per ha., together with intermediate volumes in a number of cases. The results showed that low-volume treatment of cereals with Tripastide and Triacide were as effective for controlling weeds and increasing grain yields as high-volume treatment with ammonium DNOC. For treating linseed and flax, DNOSBP was preferable to the DNOC compounds.—P.J.B.

249 SCHEFFER, F. and others. Die Vernichtung der Keimfähigkeit von Unkrautsamen bei der biologischen Gaserzeugung. [**Loss of viability of weed seeds by the biological production of gas.**] *Landw. Forsch.* 1955, **7,** No. 3, 200-3, bibl. 8, illus. [Agrik-chem. u. Bodenkundl. Inst., Univ. Göttingen]

An experiment is described which demonstrates that ammonia is the chief agent in causing loss of viability of weed seeds in stable manure. "Bihu" gas [a German trade name for gas produced by the biological activity of humus] had no effect on dormant seeds but stopped further growth of seeds already in process of germination. It is concluded that the concentration of gases produced during the normal process of decomposition of stable manure is sufficient to kill most of the weed seeds contained therein within 20-30 days.—D.B.

250 FERRARINI, E. Ricerche sulla flora infestante delle colture in Italia. 6. Le erbe infestanti di un terreno dell'Alta Lunigiana (Massa Carrara). [**Research on the noxious flora of crops in Italy. 6. Noxious plants on a soil of the Alta Lunigiana (Massa Carrara).**] *Nuovo G. bot. ital.* 1954, **61,** No. 2-3, 133-81, bibl. 15, illus., English summary p. 181. [Ist. Bot., Univ. Firenze]

The Alta Lunigiana has a mild climate and a high rainfall (1600 mm. per year). A study was made of the weeds found in 1951-2 in 4 fields in which a 2 years' rotation was practised, i.e., maize/wheat in 2 fields and potato/wheat in the others. Clover was grown as a catch crop after wheat. The 262 weed species found are listed with notes on Raunkiaer's biological class and length of the vegetative life. Of these, 104 species only were actually found in the fields. The remainder were found growing along the borders of the fields, around houses or on walls. The frequency of each weed throughout the year is examined for each field. A comparative study is made with the weeds found in other environments in relation to temperature and rainfall [see *Fld Crop Abstr.* 7 : 645 and 3 : 1137]. A geographical analysis is made of the principal weeds.—E.B.O.

CROP BOTANY

251 SÁNCHEZ-MONGE, E. and VILLENA, L. M. Nuevas variedades botanicas en especies del genero *Triticum*. [**New botanical varieties of species of the genus *Triticum*.**] *An. Esta. exp. Aula Dei* 1954, **3,** No. 2, 253-60, bibl. 6.

Descriptions in Latin and Spanish are given of 26 new varieties of *Triticum* present in the collection of the Estación Experimental de Aula Dei.—E.B.O.

252 GILL, W. R. **A method for studying the influence of aeration and mechanical impedance on seedling roots.** *Diss. Abstr.* 1955, **15,** No. 7, 1156. [Cornell Univ., Ithaca, N.Y.]

A description is given of apparatus for growing plant roots in a glass bead medium, to which pressure can be applied by means of a rubber diaphragm actuated by compressed gas. The apparatus has limitations, but is regarded as a valid means of studying the relation between root growth and mechanical impedance and aeration. Studies with this apparatus indicated: (a) decreasing the percentage of O_2 in the root atmosphere reduced the growth rate of maize seedlings, (b) increasing the mechanical pressure on the rooting medium decreased the growth rate of maize seedling roots, particularly in the case of the initial increases in mechanical pressure, (c) the lower the O_2 content of the root atmosphere, the lower the maximum pressure the roots could exert.—P.J.B.

253† SNOW, Mary and SNOW, R. **Regulation of sizes of leaf primordia by growing-point of stem apex.** *Proc. roy. Soc.* 1955, **144,** No. 915, 222-8, bibl. 5, illus.

Previous experiments have shown that in seedlings of *Lupinus albus*, as probably in other species, a certain minimum free area must be available on the surface of the apical cone far enough below the summit or growing-point before a leaf primordium can be determined. If now the growing-point is weakened by being pricked with a fine glass needle, the apical cone below it grows on, and new leaf rudiments arise from much narrower bases

than normal. This indicates that normally the growing-point inhibits the determination of a leaf rudiment below it until the growth of the apical cone makes available a free area that can overcome the inhibition from the growing-point, being far enough below it and large enough to possess the necessary vigour. In this way it is now possible to interpret physiologically the need for a minimum free area for leaf determination.—From authors' summary.

254† ARONOFF, S. **Translocation from soyabean leaves.** *Pl. Physiol.* 1955, **30,** No. 2, 184-5, bibl. 1, illus. [Iowa State Coll., Ames, U.S.A.]
An apparatus for the generation and administration of radiocarbon dioxide to localized areas of a leaf rather than to the leaf as a whole, is described and illustrated.—D.B.

255† WATANABE, K. **Studies on the germination of grass pollen. 1. Liquid exudation of the pollen on the stigma before germination.** *Bot. Mag., Tokyo* 1955, **68,** No. 800, 40-4, bibl. 9, illus. [Agric. Fac., Univ. Kyoto, Japan]
A description is given of processes undergone by pollen grains in contact with the stigmas of 28 species of Gramineae. Viable pollen grains exuded a liquid when in contact with the stigma, accompanied by a wart-like bulging of the surface of the pollen grains. The liquid appeared within 10-30 sec. of the contact of the pollen grains with the stigmas in the case of many species. With maize, the wart-like change in the pollen grains occurred at 40-50 min. after contact of the pollen with the stigmas. The process undergone by the pollen in contact with the stigmas followed the order: liquid exudation, formation of wart-like processes, nipple-like protrusion at the germ pore (usually 1-2 min. after pollination), growth of germ tube.—P.J.B.

256† LAKON, G. and BULAT, Helene. Die Feststellung der Keimfähigkeit der Kompositenfrüchte nach dem Topographischen Tetrazolium-Verfahren. [**Determination of seed viability in the Compositae by the topographical tetrazolium method.**] *Saatgutwirtschaft* 1955, **7,** No. 8, 230-3.

257† GARRARD, Anne. **The germination and longevity of seeds in an equatorial climate.** *Gdns' Bull.* 1955, **14,** No. 2, 534-45, bibl. 7. [Dep. Bot., Univ. Malaya]
The percentage germination of the seed from 28 plant species, including local and imported tropical plants, was determined, immediately after collection and at monthly intervals after storage up to 10 months, in Singapore where conditions of high temperature (74°-89°F.) and high relative humidity (generally above 90%) prevail. The seeds, which were ripe and air-dried, were stored in glass tubes with tightly fitting corks. After 10 months only 6 species had viable seed. The permeability of the seeds of *Urena lobata* and *Adenanthera pavonina* decreased during storage but their viability did not decrease. After 10 months' storage, the percentage germination of *U. lobata* was 100 and 35 and of *A. pavonina* 100 and 0, for scarified and non-scarified seed, respectively.—E.B.O.

258 CARR, D. J. **On the nature of photoperiodic induction. 3. The summation of the effects of inductive photoperiodic cycles.** *Physiol. Plant.* 1955, **8,** No. 3, 512-26, bibl. 20. [Bot. Dep., Univ. Melbourne, Australia]

259† KENTEN, R. H. and MANN, P. J. G. **The oxidation of manganese by illuminated chloroplast preparations.** *Biochem. J.* 1955, **61,** No. 2, 279-86, bibl. 21, illus. [Biochem. Dep., Rothamst. Exp. Sta., Harpenden, Herts]
Leaf extracts from *Pisum sativum* and *Vicia faba* were used. It is suggested that oxidation is due, in part, to peroxidase systems and that a manganese oxidation-reduction cycle may play a part in the reactions of photosynthesis.—From authors' summary.

260† KONOVALOV, I. N. and MIHALEVA, E. N. [**The use of labelled carbon (C^{14}) in studying the physiological adaptation of plants to their media.**] [Russian] *Bot. Z., SSSR* (*Bot. J. USSR*) 1955, **40,** No. 3, 411-14, bibl. 10, illus. [Komarov Bot. Inst., Leningrad]
The method used for this study (in which leaves of *Juglans regia* comprised the experimental material) is that recorded by Zalenskiĭ and others in *Trudy Komarov Bot. Inst. Ser. 4* (*Exp. Bot.*) 10, 680-715, 1955. There is evidence of a close connexion between intensity of photosynthesis and geographical location in which the plant is grown.—M.H.

261† FOWDEN, L. **Azetidine-2-carboxylic acid : a new constituent of plants.** *Nature, Lond.* 1955, **176,** No. 4477, 347-8, bibl. 4, illus. [Univ. Coll., London, and Cornell Univ., Ithaca, N.Y.]
"This finding of azetidine-2-carboxylic acid has extended the types of cyclic nitrogen compounds known to occur in plants, for simple four-membered ring systems based on azetidine have not previously been recorded. The existence in plants of this lower analogue of proline follows closely upon the recent discovery in plants of the higher analogue of proline, pipecolic acid."—Extract.

262† BIDDULPH, O. **Studies of mineral nutrition**

by use of tracers. *Bot. Rev.* 1955, **21,** No. 5, 251-95, bibl. 240. [State Coll. Washington, Pullman]

263† GÜNZEL, G. Der Einfluss des Mangans auf Qualität und Fermentgehalt einiger Kulturpflanzen. [**The influence of manganese on the quality and enzyme content of crop plants.**] *Z. Pflbau* 1955, **6,** No. 3, 134-41, bibl. 25. [Techn. Hochsch. München-Weihenstephan, Bavaria]

The test plants in this 3-year experiment included beans and cereals (for grain and straw), growing in a fen-type soil. Observations were made on the influence of Mn on : the carbohydrate content, protein content (decreased in cereals), the hydrolytic enzyme activity (decreased), the length and dry weight of sprouts from germinating grain (increased), and the *l*-ascorbic acid content of the grain (increased). In these soils, applications of $MnSO_4$ at rates of 50 and 100 kg./ha. gave bigger yields of better quality.—D.B.

264† SCELFO, Carmela. Sulla localizzazione dei microelementi nei vegetali. Ricerche eseguite sul boro e sul manganese. [**The localization of micro-elements in plants. Investigations on boron and manganese.**] *Ann. Sper. agr.* 1955, **9,** No. 4, 901-9, bibl. 13, English summary p. 909. [Sta. Chim.-agr. Sper., Torino, Italy]

This study was carried out with plants of millet [*Panicum miliaceum*], flax [*Linum usitatissimum*], buckwheat [*Fagopyrum* sp.], chickpea [*Cicer arietinum*] and mustard grown in pots with nutrient solutions. The general conclusions were : (a) mustard excepted, the plants studied were shown to be less exacting for B than for Mn ; (b) the positive effect of Mn, consisting in an increase in yield and a greater absorption of minerals, was particularly evident in the case of flax and mustard ; the positive effect of B was evident in the case of mustard only ; (c) the quantities of B and Mn accumulated in the leaves appeared to be nearly always greater than in the seeds and stems, but this increase was often only apparent as it was due to a greater accumulation of minerals in the leaves ; (d) a real accumulation of B was observed in the leaves of buckwheat only, and of Mn in the leaves of buckwheat, chickpea and mustard.—E.B.O.

265 ALLERTON, F. W. **A recent advance in the correction of trace element deficiencies.** *J. roy. agric. Soc.* 1955, **80,** Pt. 9, 416-20, bibl. 1.

A brief account is given of sequestered and chelated metallic trace elements.—C.L.S.

266 BHARGAVA, P. N. **Estimation of α-, β- and γ-celluloses, hemicelluloses A and B and lignin, in some of the Indian woods, shrubs and herbs.** *J. sci. Res. Banaras Hindu Univ.* 1954-55, **5,** No. 2, 72-5, bibl. 5.

267† LÜDERS, R. and HÜSER, R. Die photometrische Bestimmung von Kupfer, Molybdän und Titan in Pflanzen. [**The photometric determination of copper, molybdenum, and titanium in plants.**] *Landw. Forsch.* 1955, **7,** No. 3, 212-16, bibl. 9, illus. [Lab. Erdbereitung, Hamburg-Blankenese]

268† GUSTAFSON, F. G. and LINDENMAYER, A. **Determination of Fe^{55} in plant material by the thiocyanate method.** *Pl. Physiol.* 1955, **30,** No. 2, 182-4, bibl. 5. [Univ. Michigan, Ann Arbor]

269† CAVELL, A. J. **The colorimetric determinations of phosphorus in plant materials.** *J. Sci. Fd Agric.* 1955, **6,** No. 8, 479-80, bibl. 4. [N.A.A.S., Wolverhampton]

The determination of phosphate in the presence of hydrochloric acid with Cavell's ammonium vanadate-ammonium molybdate reagent has been studied and made quantitative. It is suitable for plant materials containing up to 1% P_2O_5. [See also *Herb. Abstr.* 25 : 172.]—M.P.

270† BALKS, R. and PLATE, Elisabeth. Untersuchungen über den Nitratgehalt von Futterpflanzen. [**Examination of the nitrate content of fodder plants.**] *Landw. Forsch.* 1955, **7,** No. 3, 203-11, bibl. 4. [Joseph-König Inst. der Landwirtschaftskammer, Westfalen-Lippe, W. Germany]

The nitrate content of fodders was investigated as a result of the discovery that a high nitrate content leads to physiological blood disturbances. The average nitrate content of fodders used for hay and silage grown under a wide variety of conditions in Westfalen-Lippe was first determined. The effect of increasing quantities of mineral N-fertilizer was then determined on plants grown in pots and in the field. In pot experiments, *Lolium perenne* and *Festuca pratensis* accumulated large quantities of nitrate. In field experiments, the nitrate content of the pasture and meadow grasses and fodder rye remained practically unchanged ; in fodder maize, spring-rape, turnip, fodder- and sugar-beet (root and tops) it increased. The question of growing fodder crops on fields irrigated with sewage effluent was investigated.—D.B.

271 PENNACCHIOTTI, I. and others. Tabla de valores nutrivos de forrajes cultivados en el país. [**Table of nutritive values of fodders grown in the country.**] *Bol. Inst. Invest. vet.* 1952, **1,** No. 7, 1-11, bibl. 16, English

summary p. 11. [Minist. Agric. Santiago, Chile]

Tables are presented showing the chemical composition of herbage and field crops grown in Chile for fodder.—W.J.B.

272† SCHUURMAN, J. J. Een nieuwe methode voor het gezamenlijk conserveren van profielen en bijbehorende wortelstelsels. [**A new method for conserving together profiles and corresponding sections of root systems.**] *Landbouwk. Tijdschr., Wageningen* 1955, **67,** No. 6, 389-94, bibl. 7.

273 BURSTRÖM, H. **Evaluation of the growth activity of naphthalene derivatives.** *Physiol. Plant.* 1955, **8,** No. 1, 174-88, bibl. 16. [Bot. Lab., Univ. Lund, Sweden]

The results are given of root growth tests, using wheat, of the activity of 1- and 2-naphthaleneacetic and 1- and 2-naphthoxyacetic acids.—P.J.B.

274 SPIERINGS, F. Schade door luchtverontreiniging aan land- en tuinbouwgewassen in Nederland. [**Damage to farm- and market-garden plants in the Netherlands caused by pollution of the atmosphere.**] *T.N.O. Nieuws* 1955, **10,** No. 111, 229-33, illus. [Inst. Plantenziektenk. Onderz., Wageningen]

An account is given of damage to plants caused in various regions of the Netherlands by the pollution of the atmosphere. The pollution is generally caused by gases arising from factory processes. Compounds containing F, S, Cl, caused damage to trees and plants. It was concluded from leaf analyses made on damaged plants that SO_2 caused damage to potatoes and maize. The burning of cable insulation-material (containing tar) was held responsible for damage to potato plants near Arnhem.—W.J.B.

MISCELLANEOUS

275 FUSSELL, G. E. **Crop nutrition in Tudor and Early Stuart England.** *Agric. Hist. Rev.* 1955, **3,** Pt. 2, 95-106, bibl. 40.

276 MINISTRY OF AGRICULTURE, FISHERIES AND FOOD. ENGLAND AND WALES. **Nitrogenous fertilizers for farm crops.** *Adv. Leaflt. 441. Minist. Agric., Fish., Fd England and Wales* 1955, pp. 6.

277† OEEC. **Manures and fertilizers. Potential progress in Europe.** *Publ. AG/E(53)4. OEEC* 1954, pp. 116, 6s.

278 LEWIS, A. H. **Field experiments with nitrophosphates.** *J. agric. Sci.* 1955, **46,** Pt. 3, 287-91, bibl. 3. [Jealott's Hill Res. Sta., Bracknell, Berks]

The results of field experiments to compare the effects on crop yields of the phosphate in Billingham nitrophosphates and in superphosphate are reported. The nitrophosphates gave similar increases in yields of swedes as superphosphate. The 1950 and '51 products gave about 70% of the increase in yield given by superphosphate, and the 1952 product about 90%, on potatoes.—From author's summary.

279 ROYAL AGRICULTURAL SOCIETY OF DENMARK. SEED COMMITTEE. **Prominent Danish varieties and strains of agricultural and horticultural plants.** *Publ. roy. agric. Soc. Denmark, Seed Cttee* 1955, pp. 16, illus.

A brief introduction gives details of the work of the Danish State Experimental Service for Plant Culture in testing varieties. Brief descriptions are given of fodder-root, grass and legume varieties designated as first class in the most recent trial series.—P.J.B.

280 WIKLUND, K. Sorter framkomna som resultat av förädling vid Sveriges Utsädesförenings tre norrlandsfilialer. [**Varieties resulting from breeding work at the three Norrland Branch Stations of the Swedish Seed Association.**] *Sverig. Utsädesfören. Tidskr.* 1954, **64,** No. 3, 184-90, English trans. pp. 187-90.

A list is given of Svalöf varieties which have appeared on the market and of varieties for which the designation Original has been applied. The marketed varieties include : Vega, Dore, Stella, Edda I, Edda II and Åsa barley; Orion I, Orion C, Orion II, Vidar and Same oats; Bottnia A, Bottnia B, Vesta and Nola I grey peas and Björn winter rye. In the second varietal category is Nola II grey peas (Å 05323). Brief descriptions are given of each variety.—P.J.B.

281 SANDISON, A. **A method of comparing varieties in trial series.** *J. nat. Inst. agric. Bot.* 1955, **7,** No. 2, 240-3, bibl. 1, illus.

Comparison of two varieties by the number of occasions when each outyields the other is dis-

cussed, and a table and graph for assessing the significance of such ratios given.—Author's summary.

282 RIVES, M. Méthodes d'analyse pour des essais incomplets. [**Methods of analysis for incomplete trials.**] *Ann. Inst. nat. Rech. agron., Paris. Sér. B. Ann. Amélior. Pl.* 1955, **5,** No. 1, 103-18, bibl. 5. [Sta. Cent. Génét. Amélior. Plantes, Versailles, France]

283† HORVÁTH, A. and SVÁB, J. Új elgondelások a szántóföldi kísérletek értékelési módszerére. **New conceptions in the analysis of field trials.** *Növénytermelés (Crop Prod.)* 1955, **4,** No. 1, 43-66, bibl 3, illus., English summary pp. 64-5.

In its essence, the method consists in arranging the yields of the differently treated plots in the decreasing order of their magnitude, independently of the actual situation of the individual plots within the block plan. From the yields of the plots grouped according to both magnitude and treatment, average treatment characteristics of the whole experiment are then worked out, the mean of which will agree with that of the whole experiment. The discrepancy between the data of the average treatments and the mean value of the experiment represents the common discrepancies, which are to be deducted from the actual discrepancies of the individual treatments. After raising to the second power the residual discrepancies obtained for each plot, the extra error of each treatment is computed, and then the error of the difference. The computation of the significance of the difference between two treatments, the mean value of the experiment and some one treatment, is shown in detail. In addition, brief reference is made to the guiding principles which render it possible to compare several experiments, and within several experiments the "behaviour" of the individual treatments (symmetry analysis). A few mathematical problems which arise are also considered. As an entirely new procedure, the separation by signs of the squares of residual discrepancies is introduced. This procedure has a role to play in symmetry analyses of plot yields, in establishing numerically the direction of displacement of the mean due to error, and in enhancing the disclosure of the laws that govern experiments.—From authors' summary.

284† DALES, H. **An investigation into the method of reporting the presence of seed impurities in samples of crop seeds.** *Res. exp. Rec. Minist. Agric. N. Ire. 1952-53* 1955, **3,** 122-9, bibl. 1.

This paper provides fuller evidence in support of the view [reported in *Fld Crop Abstr.* 6: 1539] that the expression of weed-seed content by number would give a more accurate picture of the value of a crop seed sample from the sowing point of view than an expression of these impurities by weight.—M.P.

285† INTERNATIONAL CROP IMPROVEMENT ASSOCIATION, USA. **Minimum seed certification standards.** *Publ. 18. Internat. Crop Improve. Ass.* 1954, pp. 91.

This publication supersedes No. 17 in this series and contains details of minimum seed certification standards for all the major farm crops.—P.J.B.

286† OEEC. **Development of seed production and the seed trade in Europe.** *Publ. OEEC* 1955, pp. 138.

This publication contains technical papers read by guest speakers at the International Conference on Seed Production and the Seed Trade, organized by the Swedish Ministry of Agriculture on behalf of the European Productivity Agency of OEEC, and held in Stockholm on 12-17 July.

The following papers were read :

1. Seed production in Sweden. By E. Åkerberg, pp. 17-24.
2. Present-day status of seed production, testing and distribution in the OEEC-participating countries. By G. Nilsson-Leissner, pp. 25-36.
3. The preliminary study of new varieties of cultivated plants from the point of view of the authorities. By R. Mayer, pp. 37-46.
4. Testing of new varieties from the point of view of the plant breeder. By Å. Åkerman, pp. 47-59.
5. The need for uniform variety trials in participating countries. By A. Sandison, pp. 61-70.
6. The standardization of official lists of varieties in the participating countries. By R. Milatz, pp. 71-82
7. The desirability of a uniform international terminology in relation to seed certification schemes. By A. Kjaer, pp. 83-90.
8. Aspects of import and export regulations. By N. H. H. Addens, pp. 91-5.
9. Plant quarantine regulations in international seed trade. By E. Gram, pp. 97-101.
10. Possibilities of seed production and multiplication in the most suitable areas of the participating countries. By M. Thielebein, pp. 103-10. —P.J.B.

287† BAWDEN, F. C. **Virus diseases of plants.** *J. roy. Soc. Arts* 1955, **103,** No. 4952, 436-51.

An account is given of recent advances in the therapy and prophylaxis of virus diseases. Specific examples of heat therapy, the use of ultraviolet radiation, substances of possible value as inhibitors of infection and the use of insecticides are discussed, with suggestions as to their mode of action in the light of present knowledge.—M.P.

288† HEFTI, J. Das Zugkraft- und Transportproblem im Hangbetrieb. [**The traction power and transport problem in farms on steeply sloping land.**] *Alp. Mh.* 1955, **89,** No. 6, 221-79, illus. [Brugg, Switzerland]

The cheapest and most efficient forms of transport for a variety of purposes on alpine farms in Switzerland and the Austrian Tyrol are described. A large part of the paper is devoted to examples of the use of aerial and ground-level cables for transporting hay and other products from one part of the farm to another.—D.B.

289† FAO. **The Agricultural Division of FAO. A summary of its organization, development and accomplishments from 2 December 1946, to 31 December 1954.** *Pap. 55/4/2456. FAO* 1955, pp. 153.

290† INSTITUTO AGRONÔMICO DO SUL. Organização e trabalhos. [**Organization and work of the Instituto Agronômico do Sul.**] *Bol. tech. 9. Inst. agron. do Sul* 1954, pp. 44, bibl. 19, illus. [Pelotas, Brazil]

291 GRILLOT, G. Les travaux du Service de la Recherche Agronomique et de l'Expérimentation Agricole en 1954. [**The work of the Service de la Recherche Agronomique et de l'Expérimentation Agricole in 1954 (Morocco).**] *Terre maroc.* 1955, **29,** No. 305, 123-38, bibl. 35.

REPORTS

The notes below indicate the main investigations in the reports covered, in so far as they concern this journal. Where a separate abstract has been made from a particularly interesting section of a report, this is indicated.

292 **Northern Ireland** Ministry of Agriculture. Research and Experimental Record 1952-53, Vol. 3. Belfast, 1955, pp. 273.

INVESTIGATIONS REPORTED :

1. Control of wireworms in potatoes, pp. 168-9. In preliminary trials, 1·5% Aldrin dust applied at rates as low as 2 lb. per ac. gave highly efficient control of wireworms.
2. Flax variety trials, pp. 204-5. In 3 seasons, Stormont Gossamer L26, the control variety, and Stormont Morley gave the best all round performance.
3. Fodder-beet trials, pp. 237-8. In a date-of-sowing trial, a sowing in mid-April yielded 2 tons per ac. more than sowing in mid-May. In a date-of-harvesting trial in 1952, late harvesting in November, gave a substantial increase over early harvesting, but in 1953 the results were varied. In neither trial was the dry-matter content of the fodder-beet significantly affected.
4. Potato variety trials, pp. 255-6. Of the 5 early varieties on trial, Ulster Prince gave the highest proportion of ware-size tubers, and the lowest proportion of chats and seed tubers. The total yields of all varieties were similar. In the 6 years' trials with 4 maincrop varieties, Arran Banner and Stormont Dawn gave the highest and second-highest average yields but the former had a high proportion of diseased tubers. A later introduction, Ulster Supreme, was satisfactory.
5. Fodder-beet variety trials 1951-3, pp. 257-61. Hunsballe X had the highest dry-matter content of all varieties, but was variable in dry-matter yield. Gul Otofte X, Pajbjerg Rex X and Red Otofte X, were similar in dry-matter yields, but Pajbjerg Rex X was consistently higher in dry-matter content.
6. Manurial experiments with fodder-beet, pp. 262-8. Results from the counties in 1952 and 1953 confirmed the results already recorded. [See Abs. 142.]—M.P.

293 **Republic of Ireland** Ministry of Agriculture. Twenty-third annual report of the Minister for Agriculture 1953-54. [n.d.], pp. 190, append. + index pp. 87. [Received Aug., 1955]

INVESTIGATIONS REPORTED :

1. Spring wheat trials, p. 67. The varieties Atle, Progress, Ella and Karn II were tested at 53 centres. Progress outyielded Ella by 1·9 cwt. per ac. Other yield differences were not significant.
2. Barley trials, pp. 67 and 89. In one trial, Ymer and Herta yielded similarly and were superior in yield to Beorna. In other trials, Carlsberg, Beorna and Spratt Archer × Kenia 22/11 outyielded Spratt Archer by over 3·5 cwt. per ac.
3. Oats, pp. 10-11 [append.] Bonstar, which was bred by the Department of Agriculture, was found to be equal in yield to the popular variety, Glasnevin Triumph, but was much shorter strawed and was resistant to lodging.—M.P.

294 **Netherlands.** Stichting voor Coördinatie van Cultuur Onderzoek van Broodgraan, Wageningen. Vijfde CoCoBro-Jaarboekje 1955. [Fifth CoCoBro Yearbook.] 1955, pp. 116, English summaries.

INVESTIGATIONS REPORTED :

1. Determination of resistance to sprouting in the ear in wheat by germinating the grain in sand. By H. Hänsel, pp. 31-6. [See Abs. 19.]

2. Aspects of the determination of cold-resistance in cereals. By G. Dantuma, pp. 37-43.
3. Barn-drying of cereal grain. By J. Kreyger, pp. 52-8.
4. The baking quality of wheat varieties grown in the Netherlands. By J. de Miranda, pp. 59-63.
5. Research on cereals in the Netherlands in 1955, pp. 72-100.—W.J.B.

295 **France.** Institut National de la Recherche Agronomique. Travaux effectués par les stations agronomiques en 1953. [Work of the agronomic stations in the year 1953.] *Ann. Inst. nat. Rech. Agron., Paris. Sér. A. Ann. agron.* 1954, **5**, No. 5, 653-927.

INVESTIGATIONS REPORTED :

1. Foliar diagnosis. By L. Maume and J. Dulac (Montpellier), p. 712. Preliminary experiments with maize. On account of the variation in composition of different leaves during vegetative growth, a given leaf at a given physiological stage should be selected for the chemical analysis.
2. Influence of the nature of the N fertilizer on the type of N compound in the plant. By P. Gouny and R. Mazoyer (Antibes), p. 715. N was applied as nitrate and as ammonium salt to maize, pea and lupin grown in sand culture with and without Ca. Compared with nitrate nutrition, ammonium salts markedly increased the soluble N content of these plants. In maize (a plant which is resistant to calcium chlorosis) the increase of soluble N was the same whether Ca was present or absent from the culture medium, while in pea and still more so in lupin (a plant susceptible to calcium chlorosis) the increase in soluble N compounds was greater in a calcareous than in a non-calcareous medium. Exclusively ammoniacal nutrition had no effect on the yield of peas, but resulted in decreased yields of maize and lupin. In the case of lupin, Ca accentuated the depressive effect of ammonium nutrition on yield, whereas in maize it modified the effect.
3. The influence of N fertilizer on the N content of wheat grain. By A. Nourisson and others (Dijon), p. 715. The application of 80 kg. N/ha. to Providence wheat resulted in a 50% increase in N content of the wheat grain.
4. Biochemical control of the nutrition of several wheat varieties grown in different parts of Auvergne. By L. Gachon (Clermont-Ferrand), pp. 717-20. Mineral nutrition was controlled by analysing the 2nd and 3rd leaf on the flowering stem at the beginning of heading. The different environments were provided by soil, subsoil, manuring and irrigation. The results of leaf analyses yields and grain/straw ratio show that, owing to their power to influence water relations, soil and sub-soil have a greater influence than variety and manuring on the chemical composition of the leaf.
5. Underground irrigation trials at Dijon. By G. Mathieu (Dijon), p. 729. Experiments on maize (Wisconsin 255) reported in *Fld Crop Abstr.* 7 : 1449 were continued. A dry period during August and September [1953] caused the tops of maize ears [grown without irrigation] to shrivel. In such circumstances underground irrigation resulted in a 20% increase in yield.
6. Effect of fertilizers on field crops, pp. 754-881. Detailed accounts are given of the effect of different times of application and differnet forms of N, P and K fertilizers on yield and chemicalcontent of wheat, barley, maize, rice, sugar-beet and potato. The experiments with each fertilizer were conducted at several stations and hence provide a wealth of information on results obtained on different types of soils. Most of the results have been statistically analysed.—D.B.

296 **Sierra Leone** Department of Agriculture. Report for the year 1953. Freetown, 1955, pp. 36.

INVESTIGATIONS REPORTED :

1. Long grass leys and soil fertility, Njala, p. 10. Yields of upland rice were greater in the second year after the ley than in the first.
2. *Tephrosia candida* and soil fertility, Njala, p. 10. Superphosphate maintained better yields of paddy than other fertilizers, and further increases were obtained with an additional top-dressing of 2 cwt. sulphate of ammonia per ac. applied just before flowering to the second crop of Upland rice grown after the legume.
3. Groundnut trials, Njala, p. 10. Decorticated seed germinated a week before undecorticated seed but final yields were similar. In cultivation trials, deep and shallow cultivation again showed no significantly different results.
4. Continuous cultivation of annual crops, Njala, pp. 10-11. In 1952, land continuously cultivated since 1935, was deeply cultivated in the dry season. It was then ridged by hand into 4 ft. ridges with ties every 12 ft. Yams received a placement of mixed fertilizers and were planted on the ridges. After the first heavy rains, upland rice was scattered in the furrows, and, late in the rains, after harvesting the rice, cowpeas were planted half way up the ridges. Cassava was planted in the plot boundaries and in empty spaces. Yields in 1952 were promising ; in 1953, with additional superphosphate, they were still better.
5. Fertilizer trials with rice, p. 18. At Kasanko and Gbinty, superphosphate and triple superphosphate had a marked effect on paddy yields, and there were high residual responses in the second year. In many localities, an application of 1-2 cwt. superphosphate per ac. gave the highest yields of paddy if applied to swamp rice at planting.
6. Yams, Kenema, p. 20. Seed yams "capped"

with manure at planting gave greater yields than "uncapped" yams. Chinese yams benefited more by the late-March planting than by the late-April planting.
7. Rice variety trials, p. 23. The Indo-China strain, No. 53, gave the highest average yield over 4 years, and survived the abnormal flood year of 1952 better than other strains or the local variety, Mbagboli.
8. Time of planting trials with Indo-China 53 rice, p. 23. At Subu, a low site, mid-March to early April was best, whereas at Gandema, a high site, mid-April to early May was best.
9. Variety trials with local groundnuts, New England, p. 31. Satema and Konkodugi were most resistant to leaf spot ; Maras, Mbanya, Nikile and Satema were top yielders ; Kondkodugi and Kolasaba produced the best ground cover.—M.P.

297 **Sudan Government.** Research Division of the Ministry of Agriculture. Annual Report for 1951-52. 1954, pp. 191, illus. [Received August, 1955]

INVESTIGATIONS REPORTED :
1. Rotation experiments, pp. 17-19. In 2-course rotations, cotton yields were higher when grown after lubia (*Dolichos lablab*) than after a fallow or dura (*Sorghum vulgare*). In 3-course rotations, yields were best in the cotton/lubia/fallow rotation followed by the cotton/dura/lubia rotation.
2. Nitrogenous fertilizers, pp. 24-5. Cotton yields were increased 35% after application of 40 rotls N per feddan, and 62% after 80 rotls N. Response was greater to N applied at sowing or 6 weeks after, than 8 weeks before sowing. Hoeing the two fallows before cotton in this experiment increased yields by 1 kantar per feddan [1 kantar = 315 rotls, 1 rotl = 0·99 lb., 1 feddan = 1·038 ac.]
3. Fallow hoeing experiments, p. 25. Hoeing the fallow immediately before dura gave a 65% increase in yield of heads, and there was a significant increase from the residual effect of 80 rotls N applied to the previous cotton crop.
4. Crops. By H. Ferguson, pp. 28-35. Sunflower. Yields of about 900 rotls of seed per feddan were obtained from Striped Gray and two Saratov varieties. Oil seeds. *Hyptis spicigera* grew well at the irrigation garden. Niger seed (*Guizotia abyssinica*) was unsuccessful as a summer and as a winter crop at the Gezira Research Farm. Deccan hemp. Early sowing before August resulted in greater yields than later sowing at Wad el Nau and the Gezira Research Farm, but the crop was smaller and yielded less than in Equatoria. Jute (*Corchorus olitorius*). An Equatorial variety, ECR 576, was taller than others, but yield and height were less than in Deccan hemp. Wheat responded to N fertilizers and grew better after summer than after winter crops.
5. Plant nutrition. By H. D. Fowler, pp. 35-49. N fertilizers for cotton appeared to be more efficient in a year of high rainfall. From an exploratory nutrient experiment with cotton it appears that N and phosphate applied together, increase flower production under light, which is not brought about by either separately. Under shaded conditions, differences in flower production are small. N increases boll shedding under most conditions, especially in light ; phosphate reduces boll shedding.
6. Seed soaking experiment. By H. D. Fowler, pp. 43-6. Seeds of X1730 A cotton were soaked for 4 hr. in different nutrient solutions and then dried before sowing. Their growth and development was studied. Seeds soaked in a solution containing 80 g. ammonium nitrate + 142 g. sodium phosphate per l. had a higher growth rate and flower production than seeds soaked in other solutions. They also had the lowest fruit shedding in the open, but showed a high rate of defoliation.
7. Control of water weeds. By K. Wilson-Jones, pp. 64-7. 20 ppm. copper sulphate were required in order to obtain an effective kill of *Chara globularis*. Approximately 15 ppm. 2,4-D were effective in clearing most canals of weeds. Aromatic solvents applied as an underwater spray to the canal, at concentrations of about 600 ppm. in the canal water, showed promise against *Potamogeton crispus* and *Ch. globularis*.
8. Weed observations on the fallow hoeing experiment. By K. Wilson-Jones, pp. 67-8. After 6 years, no outstanding effects on the flora were noticeable. Hoeing reduced the weeds by 33% in 1950 and by 32% in 1951.
9. Weedkillers against Striga. By K. Wilson-Jones, p. 69. Spraying with 2,4-D at 0·75-2·5 lb. per feddan, increased the yields of dura, and reduced Striga incidence by 44-97%. [See also *Fld Crop Abstr.* 7 : 821.]
10. Hormone-resistant legumes. By K. Wilson-Jones, p. 69. *Pisum sativum*, *Vigna* sp. and *Arachis hypogaea* were resistant to MCPA and 2,4-D at 0·5 and 1 lb. per feddan ; *Medicago sativa* was resistant to the lower rate only, and *Dolichos lablab*, *Phaseolus* sp. and *Vicia faba* were susceptible at both rates of spraying.
11. Seed dressings for dura. By S. A. J. Tarr, pp. 78-9. Seeds dusted with a combined fungicide-insecticide, BHC-TMTD, dressings, in efforts to control covered smut, *Sphacelotheca sorghi*, produced much better stands than those dusted with TMTD only.
12. Seed dressings for groundnuts. By S. A. J. Tarr, p. 79. Seed dressings containing 1 : 400 by weight Agrosan G.N. increased plant emergence by 50% and yields by 40%.
13. Weeding experiment. By K. C. Barlow, p. 98. Clean-weeded cotton, BAR.SP 84, yielded 1024 lb. seed cotton per ac. ; cotton weeded early yielded

916 lb., weeded late, 677 lb., and that left dirty, 643 lb. per ac.
14. Local sorghum varieties, p. 105. Wad Aker is suitable for combine harvesting but is susceptible to grasshopper damage. Mugud and Feki Mustahi are unsuitable for combine harvesting ; the latter variety has long glumes enclosing the grain entirely, a character which is reported to make the variety resistant to birds.
15. Trials with insecticides. By R. J. V. Joyce, pp. 125-6. The use of Schradan for control of flea beetle, *Podagrica puncticollis*, in cotton resulted in markedly reduced germination. Mergamma dressings retarded germination at high concentrations.
16. Phytotoxicity of insecticides for locust control. By R. J. V. Joyce, pp. 131-2. DNOC was harmful to both crops and locusts, but 10% BHC and Toxaphene, if diluted, were not toxic to cotton or dura, but were effective against locusts.
17. Yambio experimental farm, p. 182. *Hyptis spicigera* was grown in pure stands for observations as a possible oil crop. It germinated well and the crop was free of diseases and pests. Its yield averaged 240 kg. seed per ha.—M.P.

298 **Northern Rhodesia** Department of Agriculture. Annual report for the year 1954. Lusaka, 1955, pp. 28, 2s. 6d.

INVESTIGATIONS REPORTED :
1. Weed control, p. 24. A 4% aqueous solution of 2,4,5-T killed *Lantana camara* when applied to the cut stem, but not when applied to the foliage or stem bases.
2. Maize trials, Magoye, p. 27. The varieties Southern Rhodesian Double Hybrid, Hickory King, South Special, and Eldridge Hybrid yielded 15·0, 14·7, 12·3 and 11·9 bags [1 bag = 200 lb.] per ac., respectively. Striga infection at Chadiza was seen to be appreciably less in maize plots receiving sulphate of ammonia.
3. Beans, Kasempa, p. 27. Of different types of beans on trial, soyabeans yielded 595 lb. per ac., Red Canadian Wonder yielded 121 lb. per ac.
4. Cotton, Lundazi, p. 28. Application of DDT increased the yield of seed cotton by 50% and the proportion of clean as compared with stained. Sowing before the onset of the rains gave the best yield. Optimum spacing in this dry year was 3 ft. × 2 ft., whereas in a wet year 3 ft. × 2·5 ft. is better.
5. Sorghum, Lundazi, p. 28. Of 5 varieties on trial, Mpiwe was outstanding at both centres.
6. Finger millet [*Eleusine coracana*], Northern Province, p. 28. In this trial the crop was cultivated as opposed to broadcasting the seed on the ash in burnt gardens. Manuring the crop with 12, 4 and 0 tons F.Y.M. per ac. resulted in yields of 8, 2·5 and 1·75 bags per ac. respectively.
7. Rice, Barotseland, p. 28. Nyasaland Faya (ex Kota Kota) and Burma yielded best with 2783 lb. paddy per ac., Tanganyika Faya yielded 2644 lb. and Angola Crystal 1886 lb. In a cultural experiment, Nyasaland Faya yielded 2571 lb. paddy per ac. when transplanted from a nursery, 2262 lb. when broadcast as seed and 2044 lb. when dibbled as seed.—M.P.

299 **Southern Rhodesia.** Agricultural Experiment Station, Salisbury. Annual report of experiments, season 1953-54. By A. G. H. Rattray. *Rhod. agric. J.* 1955, **52,** No. 3, 246-61.

INVESTIGATIONS REPORTED :
1. Legume/maize rotations, pp. 246-9. Velvet beans were grown for green manure, hay or seed production in rotation with S.R. Hybrid No. 1. at varying intervals. No rotation was found capable of maintaining the soil at its original level of fertility. Velvet beans and maize alternately gave best yields, while ploughing under the legume for green manure was better than harvesting it for hay or seed.
2. Crop rotation trials, pp. 249-51. Results confirmed those of the maize/legume rotations. Phosphate deficiency caused low yields, especially in the absence of N and organic matter.
3. Maize variety trials, pp. 251-3. All experimental crosses outyielded the commercial varieties such as Hickory King and Potchefstroom Pearl. Top yielders were 51H37, 50H35, 50H39 and 51H6.
4. Effects of nitrogen on the protein content of grain of varieties of maize, p. 254. [See Abs. 72.]
5. Effect of removal of parts of the plant on maize yields, pp. 254-5. Removal of the tassels and 3 top leaves at detasseling lowered maize grain yields in two years, but significantly increased the yield in one year. Cutting off the stalks above the ears at the milk stage reduced yields by 20%, and at the glazed stage by 7·5%. Removal of suckers gave a small, but insignificant increase.
6. Fodder barley, p. 257. The yield of Ymer was 7·5 bags and of Herta 7·3 bags per ac. [1 bag = 150 lb.]
7. Soyabean variety trial, pp. 257-8. Spacing at 24 in. × 3 in. consistently gave higher yields than spacings at 30 in. × 3 in. or 36 in. × 3 in. No 147 yielded best at all spacings. The Natal variety N212 matured very early and made less growth than other varieties in the trial.
8. Velvet beans, pp. 258-9. Variety No. 5 gave the highest yield in seed and hay trials. No. 57 was the latest maturing, it has the best resistance to rust and is of value as a green manure, but is a poor yielder.
9. Cowpeas. p. 259. In 3 seasons, D3 yielded best, but all yields were low.
10. Groundnuts, pp. 259-60. Top yielders in a variety trial were Virginia Bunch, Indian Coromandel and Valencia.

11. Potatoes, pp. 260-1. Kennebec and Monac yielded 149 and 111 bags per ac.; the former produced a high percentage of large tubers. Pentland Ace, which was planted late, yielded 90 bags per ac., and showed good resistance to late blight. —M.P.

300 **South Africa** Department of Agriculture. Annual Report of the Secretary for Agriculture for the year ended 31 August 1954. *Fmg in S. Afr.* 1955, **30,** No. 348, 75-199.

INVESTIGATIONS REPORTED:

1. Weeds in maize, Rietvlei Research Station. By P. W. Vorster, pp. 110-11. During the first 33 days after sowing maize, weeds had almost no effect on the final grain yield. The average daily decrease in maize grain yield, thereafter, due to weeds was: 35 lb. per morgen [1 morgen = 2·116 ac.] where weed eradication took place from the 33rd to the 56th day after sowing; 25 lb. with weed eradication from the 56th to the 82nd day; 19 lb. when weeds were eradicated only at the late milk stage; and 13 lb. thereafter until the crop was mature. In other trials, competition from weeds reduced the yield on heavily fertilized plots by 21·1 bags per morgen. [1 bag = 200 lb.] With low soil fertility, the optimum spacing was 3 ft. × 3 ft., with high fertility a spacing of 2 ft. × 2 ft. gave the highest yields. Hydrological research indicated that a gravel mulch over the surface conserved an additional 6 in. of water in the soil in summer. A straw mulch, though as effective, did not have a favourable effect on maize yields.

2. Cotton, Barberton Research Station. By P. W. Vorster, p. 111. The selection 2106 yielded 1037 lb. lint per morgen and produced the highest quality. This selection is of value for eastern lowveld areas. A456 was considered promising. In rotation trials, cotton yielded best when grown after a green manure crop, preferably sunnhemp, and the next highest yields were obtained after a 3-year ley.

3. Crops in the winter-rainfall region. By M. H. Slabber, p. 172. Dromedaris proved the best of the newly-bred wheat varieties. Jongesklip and Langgewens oat varieties were best; imported varieties proved very disappointing. Elses and Atlas 46 were the best barley varieties. The lupins S.E. Blou No. 1 (*L. angustifolius*), S.E. Geel No. 1 (*L. luteus*) and Terra (*L. albus*), produced 28·5, 19·3 and 18·3 tons of green matter per morgen, respectively. Under irrigation, fodder-beet yielded 12% less than Yellow Globe mangel and had a dry-matter content 50% lower than the mangel. Walsh and Klein varieties of linseed, sown at 140 lb. per morgen yielded best with 5·6 and 4·9 bags per morgen.

4. Crops in the Karoo and eastern Cape Region. By J. A. van Rensburg, pp. 174-8. Potato yields were highest from the maize/fallow/potato/fallow rotation. Yields of wheat and potatoes were generally better after lucerne and lucerne+ grass than after grass alone. The favourable effect of lucerne on soil productivity was still apparent in the fifth consecutive crop.

5. Vaalhartz Agricultural Research Station; O.F.S. By I. P. J. du Plessis, pp. 180-1. Top-yielding wheat varieties were Punjab, Lalkasarwali, Queen Fan and Wit Klein. Rustro was the best cotton under local conditions, when sown early with adequate fertilizer. Summer green manuring with sunnhemp, velvet beans or cowpeas increased wheat yields by 11 bags per morgen, with maize as a second crop there was an increase of 4 bags; by the third crop the effect of green manuring had practically gone.

6. Riet River Agricultural Research Station, O.F.S. By I. P. J. du Plessis, pp. 181-2. Best yields of cotton were obtained with a spacing of 24 in. The varieties A619 and Rustro yielded 4548 lb. and 4440 lb. seed cotton per morgen, respectively.

7. Bethlehem Agricultural Research Station. By K. E. W. Penzhorn, pp. 187 and 198. Results from 3 seasons show that the optimum planting date for Retriever potatoes is about the beginning of November.—M.P.

301 **South Africa.** Witwatersrand University, Transvaal. Frankenwald Field Research Station. Annual Report for 1954. Johannesburg, 1955, pp. 39, illus.

Weedkiller experiment on groundnuts, p. 34. Pre-emergence spraying proved superior to post-emergence spraying. MCPA and the amine of 2,4-D were effective and relatively safe for controlling weeds in groundnuts.

Rehabilitation of old fallows experiment. By R. E. Altona, pp. 34-5. Yields averaged 38 and 48 bags per morgen from plots in maize for the first and second year, respectively. [1 bag = 200lb., 1 morgen = 2·116 ac.] Stover yields were 4·9 and 5·6 tons, respectively. [See *Fld Crop Abstr.* 7: 1457.]—M.P.

302 **South Australia.** Waite Agricultural Research Institute and associated activities of the Commonwealth Scientific and Industrial Research Organization. Report for 1952-3. Adelaide, [n.d.], pp. 70. [Received Sept., 1955]

INVESTIGATIONS REPORTED:

1. Permanent rotation experiment, pp. 4-5, 41-4. In the various rotations maintained for at least 26 years, the 1953 wheat yields were much lower than in previous years and differences were marked. The lowest yield was from the continuously cultivated wheat plots and the highest from the wheat/oat/pasture/fallow rotation.

2. Investigations on forage crops and temporary pasture in 4-course rotations with wheat, pp. 5-6,

44-7. Wet conditions at seeding and the start of the growing season affected results, and there were indications of rapid leaching of nitrate N during the wet winter. Inclusion of peas in the rotation as compared with oats gave a substantial increase in the yield of wheat. The application of sulphate of ammonia to the oats and then grazing them, and, to a lesser extent, harvesting them, consistently benefited the wheat yields 3 years later.

3. Influence of pastures and forage crops on the yield of wheat in rotations of varying duration, pp. 7, 48-50. Leys of only 2-3 years may improve soil structure appreciably even of land for long under a wheat/fallow rotation. Wheat grown after a 6-year pasture yielded only 14·4 bu. per ac., due, in part, to take-all. This disease has been associated with the high proportion of barley grass [*Hordeum leporinum*] which became dominant in the 3rd or 4th year of the pasture phase. Seed bed preparation was also difficult following the 6-year *Phalaris* pasture.

4. Comparative yields of wheat, safflower and linseed, pp. 12-13 and 52. Under ideal conditions safflower did well at the Waite Institute and was reasonably drought-resistant. A satisfactory yield was dependent on good initial establishment. Yields of wheat and safflower were similar in 1953. The linseed variety Walsh was a very much poorer yielder than Punjab 5.

5. Crop trial, pp. 13-14, 52-3. Wheat, Saddleworth. Gabo × 3 Dirk (726) was consistent in its performance and superior to Dirk 48. Flax. The variety Ventnor, a rust-resistant derivative of Norfolk Earl was named and released. It gave good yields of straw with fibre of superior quality. Linseed, Waite Institute. Punjab × Walsh selections were promising.—M.P.

BOOKS

303† BAHTEEV, F. H. [**Barley.**] [Russian] 1955, pp. 188, bibl. 59, illus., Leningrad ; Seljshozgiz, Nevskiĭ Prospekt, 28, 2 roubles, 60 kopeks.

In 1955, the January Session of the Central Committee of the All-Union Communist Party proclaimed the need to secure in the USSR by 1960 a total grain yield of 10 million poods per annum, [1 pood = 16·38 kg. or 36·113 lb.] Because of the great importance of barley for stock feed, for human consumption and for other uses, the author has written this booklet on the cultivation and biological characteristics of *Hordeum*. The following selected sections indicate the scope of the work : the history of barley cultivation ; its distribution in USSR ; chemical composition of the plant ; yields ; systematics ; varieties grown in USSR ; biology of development and growth ; environmental influences on the plant ; cultural measures (including position in a crop rotation and soil preparation, fertilizing, sowing methods, harvesting) ; care of winter barley ; barley under irrigation ; selection and seed production ; diseases and pests.—M.H.

304 CHRISTIDIS, B. G. and HARRISON, G. H. **Cotton growing problems.** 1955, pp. vii + 633, bibl. at end of sections, illus., London ; McGraw-Hill Book Co., Inc., 24 × 15 cm., $9·70.

At first sight, a book written by a Greek professor whose American co-author has merely "seen to its suitability for the American public" (as the preface states) would not be expected to give good coverage of one of the world's most widely spread crops. Yet, in this respect, it is at least much better than might be feared. American data, quite properly, provide the bulk of the information ; Egypt and the Sudan are fairly well represented, and India (which, however, throughout the book is not properly differentiated from Pakistan) unexpectedly well ; from British and foreign colonies and South America comparatively few data are quoted. Like many other writers, the authors are not aware of the vast mass of results embedded in the investigational sections of annual reports of Departments of Agriculture in the British colonies ; reference to these would obviate the need for such statements as that "in the literature there is hardly any reference" to field trials on the interplanting of cotton.

The book opens with a part on cotton varieties. Not much space is given to botanical description ; but it is rather a relief to be spared the old obsession with the sympodial or monopodial characters of the plant. There is a very lucid treatment of the terms used by graders and scientists in describing lint characteristics. The chapter on cotton breeding has obviously presented the usual dilemma that, if the treatment is technically detailed enough to be useful to the breeders themselves, it will be unintelligible to the average agronomist, whereas if it is made intelligible to the latter it will be of little value to breeders. The authors have chosen the latter, and probably wiser, course. The following chapter on "leading cotton varieties" deals with only six countries.

The remaining seven parts of the book cover the

agronomy of cotton in the widest sense. They are again too incomplete to serve as a work of reference. The chapter on insect pests, for instance, contains no reference to *Prodenia* ; and that on diseases only half a sentence on leaf curl. The final chapter on mechanical harvesting is of considerable interest, but shows only photographs of the external aspects of pickers, with no diagrams or detailed description of the mechanisms involved. The virtue of the book is the thoughtful treatment of all aspects of agronomy, which will make the whole of it interesting reading for all scientists concerned with cotton production. Some small essays on agronomic problems are included which go far beyond considering only the cotton crop and often touch on little-studied subjects such as the bad effect of sorghum on succeeding crops or the beneficial effect on yield of growing certain mixtures of cotton varieties (to which it has been stated, rather surprisingly, that spinners would not object).

The English of the text is in some places awkward, and occasionally not clear in meaning. When told that *Gossypium sturtii* " is grown wild" in Australia, the uninstructed reader may not be sure whether this is a cultivated or wild species. There are also some errors in dealing with unfamiliar literature (Brenchley is not a male author, Metge writes of French West Africa and not Nigeria). The advice on p. 3 that " the intelligent farmer should experiment for himself " with different cotton varieties would be unacceptable in many cotton-growing countries. The section on trace elements is vitiated by the fact that no information is given on the soils, and sometimes not even on the locality, where adequacies or deficiencies of different elements were found.

For the reasons given above, this is not one of those books of which a reviewer can say confidently that it will become a standard reference text. But every cotton agronomist will learn something new from it, and will find it always interesting and often thought-provoking ; and this after all, from the title of the book, is presumably what it sets out to be.—G. B. Masefield.

305† Council of Scientific and Industrial Research. India. **The wealth of India. A dictionary of Indian raw materials and industrial products. Raw materials. Vol. 3 : D-E. (With index to Vols 1-3.)** 1952, pp. 236 + xxx, New Delhi ; C.S.I.R., 29 × 22 cm., Rs. 18. [Received March, 1955]

The Wealth of India is published in two sections, " Raw Materials " and " Industrial Products." So far, 3 volumes of each section have been published and in the case of each section the volumes have been numbered 1-3. The section on " Raw Materials," Vols 1-3, is of prime importance for students of Indian agriculture, since it is almost entirely devoted to plants (cultivated and wild) of economic importance. A detailed account of the botany, distribution, cultivation and economic importance of each plant is given. There are numerous illustrations.—W. J. Baulkwill.

306 Commonwealth Economic Committee. **Grain crops. A review of production, trade and consumption relating to wheat, wheat flour, maize, barley, oats, rye and rice.** 1955, pp. 150, London ; H.M. Stationery Office, 25 × 18 cm., 5s.

307† Grossheim, A. A. [**Flora of the Caucasus. Vol. 5. Rosaceae—Leguminosae.**] [Russian] 1952, pp. 453 + xxi, 528 maps, illus., Moscow ; Acad. Sci. USSR, 17 × 25 cm., 50 roubles 15 kop. [Received 1955]

308† Zerov, D. K. (Ed.) [**Flora of the Ukraine. Vol. 6.**] [Ukrainian] 1954, pp. 610, illus., Kiev ; Acad. Sci., Ukrainian RSR, 17 × 25 cm., 35 roubles, 65 kop.

309 Mouat, G. C. and Coleman, F. **Tillage implements.** 1954, pp. xi + 170, bibl. 16, illus., London ; Temple Press, Ltd. (in association with *Fm Mech.*), 22 × 14 cm., 21s.

This book, after tracing briefly the development of tillage implements from early times to the present day, shows how their application to the soil helps to provide conditions favourable to efficient crop production. The design, construction, adjustment and utilization of modern implements for ploughing, seed-bed preparation, row-crop cultivations and crop thinning are discussed, and a chapter is devoted to analysis of the weight-transfer relationships between the tractor and both trailed and mounted ploughs. Appendices are included to enable rapid estimates of the rates of working and the correct loading of tractors to be made. A glossary of terms and comprehensive bibliography and index are also provided. This publication should prove a valuable source of information to engineers, farmers, advisers and students alike.

310 UNESCO. **Arid Zone Programme. 4. Reviews of research on problems of utilization of saline water.** 1954, pp. 96, Paris ; UNESCO, 27 × 21 cm. [Received April, 1955]

The first paper in this review is entitled : The biological and agricultural problems presented by plants tolerant of saline or brackish water and the employment of such water for irrigation, by G. Grillot. Aspects considered include : plant physiology in relation to salinity, plant life in saline or alkaline conditions, the use of saline and brackish water for irrigation and regional climatic

problems. Appendices contain tables of halophytic indicator plants for assessing the cultivability of domestic species, the resistance to chlorine of cultivated plants and the specific sensitivity of domesticated plants to salinity in the soil solution. There is a bibliography of 245 items. The second paper presented is entitled : Plant growth under saline conditions, based on researches in Australia, India and the Western Hemisphere, by H. E. Hayward. Aspects considered include : the classification of saline and alkali soils, the quality of water for irrigation, the physiological basis for salt and alkali tolerance, the effect of saline and alkali salts on plant growth, the toxic effects of specific ions, salt tolerance in relation to germination and specificity in salt tolerance. A regional review is given of the problem of salinity. There is a bibliography of 256 items. The third paper presented is entitled : The utilization of sea water, by E. D. Howe.—P.J.B.

311 United States Department of Agriculture. **Diagnosis and improvement of saline and alkali soils. Agriculture Handbook No 60.** 1954, pp. 160, bibl. 213, illus., Washington ; U.S. Govt. Printing Office, 27 × 21 cm., $2. [Received April, 1955]

This publication was prepared by the staff of the United States Salinity Laboratory, Riverside, California. Its purpose is to present collected and summarized information on the diagnosis and improvement of saline and alkaline soils, primarily as a source of practical guidance for professional agricultural workers confronted with problems of salinity and alkalinity in relation to soils, plants and water supplies. Aspects considered include : the origin and nature of saline and alkali soils, the improvement and management of soils in arid and semi-arid regions in relation to salinity and alkalinity, plant response and crop selection for saline and alkali soils, the quality of irrigation waters, methods for characterizing the saline and alkali status of soils, methods of plant culture and plant analysis and methods for analysing irrigation waters.—P.J.B.

312† Rural Reconstruction Association. Great Britain. **Feeding the fifty million.** 1955, pp. 138, London ; Hollis and Carter, 22 × 14 cm., 12s. 6d.

The preface to this report by its Research Committee notes that the Rural Reconstruction Association is an " independent non-party association, formed over a quarter of a century ago with the object of securing the restoration of agriculture to its rightful place in our national life." The subject of the present report is essentially controversial for it attempts to set out what steps would have to be taken to secure a substantial increase in home agricultural production of food and what changes in consumption would be required if it were necessary to rely mainly on home-produced food.

The report first reviews briefly the present state of British food supplies, noting its heavy dependence on imports and the likelihood that exportable surpluses of food will shrink and competition for them increase. It reviews the expansion in British agricultural production over recent years but tends to the view that farmers will not push this further unless they are assured that their extra efforts are needed and will be rewarded. The committee refers in this context to the relatively discouraging prices fixed for milk and eggs after production had expanded to the " target " level in the post-war expansion programmes. They conclude by emphasizing the hindering effect of farmers' scepticism and uncertainty and state that it can be overcome " only by an unequivocal declaration, subscribed to by all parties, that in future Britain will rely mainly on home produced foods and that successive governments will take whatever steps are necessary to secure a substantial and sustained increase in production . . . if farmers are to commit themselves in the national interest, so also must the nation itself."

Against this background, the report reviews the available agricultural resources and their development, farm management and its improvement, prices and marketing. Finally, the changes in consumption consequent on increased use of home produced food are examined with the broad conclusion that they need to be only mild.

The basic outlook of the authors of the report is indicated above. Many economists would not accept it and even those who consider that British agriculture should be expanded might hesitate at this sweeping approach. Given this approach, however, there still seems to be a lack of balance in devoting only about 10 per cent of the book to the chapter on prices and marketing. In consequence there are numerous points which are left vague. For example, the Committee appears to consider that milk will not be in oversupply for many years, —i.e. that we need the manufactured products which can be made from any milk which is in excess of liquid consumption. They do not, however, pursue this to the point of noting that if more and more milk is sold for manufacturing at a low price—now less than half that for liquid milk —the average price realised for all milk will gradually fall. It may be, of course, that producers might be less disturbed by such a trend than by a reduction in officially guaranteed prices but it is not obvious.—K. E. Hunt.

313† Zagoroff, Z. D. and others. **The agricultural economy of the Danubian countries 1935-45.** 1955, pp. 478 extensive bibl.,

California ; Food Res. Inst., Stanford Univ. 15 × 24 cm., $7·50.

This is the eighth in the series of volumes produced by the Food Research Institute, Stanford University, dealing with the agricultural economy of important countries or regions of the world during the second World War. In this volume, the agricultural economy of Hungary, Romania, Yugoslavia and Bulgaria during 1935-45 is reviewed in detail in the form of a symposium prepared by three economists of Eastern European origin who were present in these countries during the period in question. The volume opens with a general survey of the agriculture of the Danubian countries, including physical features, the relation of agriculture to the national economy, the history of agrarian reforms, food supplies and food balance. Each country is then considered separately. The agricultural economy of the Danubian countries during the war years was characterized by a decline in food production and consumption. The statistical data of this decline are considered together with the reasons for it. Also outlined is the progress and consequences of post-war socialization in each country.—P. J. Boyle.

314 MILLAR, C. E. **Soil fertility.** 1955, pp. xi + 436, bibl. at end of chaps., illus., London; Chapman and Hall, Ltd., 24 × 15 cm., 54s.

Dr. C. E. Millar was Head of the Department of Soils at Michigan State College from 1930 until his retirement in 1950 when he became Professor Emeritus of Soils. In his well balanced discussion of soil fertility he is mainly concerned with fairly recent work in the United States and his book will be read with appreciation by university students and by the many well informed farmers of that country. The specialist in this very important field will need to consult the original papers and more advanced text books, many of which are quoted by the author. He briefly discusses the plant's requirements of heat, light, air and water ; the intake of nutrients ; clay minerals and ion exchange ; soil reaction and lime requirement. Successive chapters then deal with soil organic matter, nitrogen, phosphorus, potassium, calcium and magnesium, sulphur, micro- and some non-essential nutrients. In these chapters much recent information is presented in lucid fashion, but there are some gaps that will be apparent to farmers less fortunately situated that are those of the Central West. Too little space is allotted to water supply ; Australia and New Zealand provide evidence of molybdenum deficiency in soils ; the *Aspergillus niger* test is used successfully for major and minor plant nutrients ; the Mitscherlich *Wirkungsfaktor* for nitrogen is quoted without criticism ; very little is said about factorial experiments as a means of investigating soil fertility. Arnold has recently reported nitrous oxide losses from soil ; in the United Kingdom, Crowther and Yates recommended use of nitrogenous fertilizer in addition to farmyard manure. On the other hand, Dr. Millar rightly stresses the need to consider quality and protein content rather than gross yield ; he notes the dearth of well designed rotation experiments and the fact that many of the earlier experiments are out-dated because fertilizers were not applied. In particular, cheap nitrogenous fertilizers and increased crop residues have opened new possibilities of raising and maintaining soil fertility. Attention is also called to the occasionally beneficial effects of weeds in a crop rotation. Dr. Millar closes with a summary of results obtained in the classical experimental fields of the U.K. and U.S.A. The book is well produced, has a good index and well chosen illustrations.—H. Greene. [From *Soils and Ferts* 1955, **18,** No. 5.]

315† WISHART, J. and SANDERS, H. G. **Principles and practice of field experimentation.** *Tech. Commun. 18. Commw. Bur. Pl. Breed. Genet.* Revised 2nd edn 1955, pp. 133, Farnham Royal ; Commonw. Agric. Bur., 22 × 14·5 cm., 21s.

Part I of this book presents, practically and with the minimum of mathematics, the statistical methods commonly needed in the reduction of experimental data, and the various standard methods of conducting field trials, profusely illustrated by worked examples. In Part II, advice is given on questions of experimental policy, on the agricultural significance of experimental results, and on many practical points in experimental lay-out and the taking of observations from plots. Together, these parts cover the syllabuses on this subject in Agricultural Colleges, and should form a convenient book of reference for agricultural research workers. The book will also be found useful to beginners in the study of statistical methods, and to those concerned with experimental design and statistical analysis in other spheres of activity.

316† FAO. **Bibliography on land tenure.** 1955, pp. 385. Rome ; FAO, 25 × 18 cm., 17s. 6d.

This publication is intended to facilitate reference to books, pamphlets, articles or laws relating to land tenure or land reforms, and it is one product of a comprehensive programme of work by FAO on the reform of agrarian structures. The references given are divided into three sections, the first dealing with studies of a general nature, the second with world regions, and the third, with individual territories.—P.J.B.

317 NORMAN, A. G. (Ed.) **Advances in Agronomy. Vol. 7.** 1955, pp. xi + 431, New York ; Academic Press Inc., 23 × 14 cm.

Among papers contributed to this volume are the following :

1. Soil aggregation. By J. P. Martin and others, pp. 1-37.
2. Recent changes in Swedish crop production. By E. Åberg, pp. 39-74.
3. Mineral nutrition of plants as related to microbial activities in soils. By C. H. Wadleigh, pp. 75-87.
4. Improvement of the sugar beet in the United States. By G. H. Coons and others, pp. 89-139.
5. Green manuring viewed by a pedologist. By J. S. Toffe, pp. 141-87.
6. Plant introduction as a federal service to agriculture. By W. H. Hodge and C. O. Erlanson, pp. 189-211.
7. The enigma of soil nitrogen balance sheets. By F. E. Allison, pp. 213-50.
8. Weed control in principal crops of the southern United States. By W. B. Ennis, pp. 251-97.—P.J.B.

NEWS ITEMS AND NOTES

Great Britain

318 Crop Protection Products Approval Scheme. At the inaugural meeting of the Pesticides Group of the Society of Chemical Industry the following papers were read : How the scheme was founded (by J. W. Munro), The work of the scheme (by de B. Ashworth), and The role of the Government Chemist in the administration of the scheme (by J. King). The scheme is a joint one between the Ministry of Agriculture, Fisheries and Food, the Department of Agriculture for Scotland and the Association of British Insecticide Manufacturers. Participation in it by a manufacturer is entirely voluntary, but he must supply evidence as to the soundness of his product. The Advisory Committee, and not the Joint Panel which includes manufacturers and other bodies, gives approval for a new product. It is believed that the scheme is working with reasonable efficiency. Of the approved products, 95% are well above the minimum standard. Revisions and improvements of the scheme are in progress. *J. Sci. Fd Agric.* September, 1955.—M.P.

319 Nomenclature of Herbage Plants (A.R.C. 524/55). At the request of the Agricultural Research Council, a small technical group has been considering the principles to be adopted in the Nomenclature of Herbage Plants, in conjunction with the Commonwealth Bureaux of Plant Breeding and Genetics, and of Pastures and Field Crops. In view of the International Discussions which have recently culminated in the publication of the " International Code of Nomenclature for Cultivated Plants ", Mr. J. S. L. Gilmour, Chairman of the International Committee on Horticultural Nomenclature, was co-opted. The following proposals are submitted : (1a) The names of intra-specific units of herbage plants should conform to the recently published " International Code of Nomenclature for Cultivated Plants ". [Published by the Royal Horticultural Society, Vincent Square, London, 1/-.] All such units at the varietal level, therefore, should be regarded as belonging to the same intra-specific category, i.e. the cultivar (abbreviated cv.). The use of such words as " Commercial ", "Indigenous " and " Pedigree " to indicate classes of cultivars should stop. (b1). Similarly, the nomenclature to be adopted for inter-specific and inter-generic hybrids should conform to the appropriate provisions of the International Code. (2). According to the Code, the full name of a cultivar should consist of the Latin name of the species (or its vernacular equivalent) followed by the cultivar name. The cultivar name should be written with a capital initial letter and enclosed in single quotation marks. The abbreviation cv. may precede the cultivar name, but this can normally be omitted, e.g. *Lolium perenne* cv. ' Scotia ', or perennial ryegrass ' Scotia '. (3). Where the same popular name covers more than one taxonomic or cytological species (the name timothy for instance, covers hexaploid *Phleum pratense* as well as the diploid *Ph. nodosum* ; and cocksfoot the diploid *Dactylis aschersoniana* and the tetraploid *D. glomerata*) it is suggested that the unqualified popular name might apply to the species most widely used and that the less common might be given prefixes, e.g. diploid timothy and diploid cocksfoot, *Trifolium hybridum* (2x) alsike, *Trifolium hybridum* (4x) tetraploid alsike. (4a) Cultivar names should conform to the International Code of Nomenclature. It must be emphasized that they should be given only where there are genuine differences in the cultivar as demonstrated by appropriate trials and tests. In the interests of the advisory services and farmers alike the use of numbers only or meaningless symbols in crop plant nomenclature should be discontinued. (4b) The International Code includes the following rules which should as far as possible be observed in allotting cultivar names for herbage plants : (i) They should be in common language (not in Latin) and consist of not more than two words. (ii) Names likely to be confused, such as ' Alexandra ' and ' Alexandria ' should not be used in the same genus. (iii) Names of countries and States without a qualifying word should be avoided, e.g. ' Oregon Wonder ' would conform, but not 'Oregon'. (iv) Names of genera should be avoided as being asource of confusion, e.g. rose " Camellia ", and plum " Apricot". (v) Excessively long words or those difficult to pronounce should not be used, e.g. ' Diplomagartenbauinspektor '. (vi) Names should be distinctive, e.g. Rose ' Yellow Queen ' not rose ' Yellow '. (vii) Exaggeration or use of superlatives should be avoided ; thus ' Earliest of All ' may soon become inaccurate by the introduction of an even earlier sort. (5). Subject to the principle that a cultivar name should as far as practicable consist of only one or two words it may include the breeder's name or the region of origin. (6). The Inter-

national Code permits the use of a "convarietal" name between the specific and the cultivar names, to indicate "convarieties" which are groups of cultivars with common features of importance to cultivators. (7.) It would be helpful if convarieties could be based on features of major agronomic significance in the region concerned. (8). Named cultivars of foreign origin marketed in Britain must retain their own names or a direct translation or transliteration of the foreign name and will be allotted to the appropriate convarieties according to their agronomic characters. Proper names of persons are not to be translated. (9). The practical value of a system of cultivar nomenclature depends largely upon linking names to official trial data, including standardized descriptions of the cultivars. It is therefore recommended that there should be a national register of those names which are linked to official descriptions. (10). In view of the scheme to this end already operated jointly by the National Institute of Agricultural Botany at Cambridge and the Plant Registration Station at Edinburgh, it is suggested that these two Stations should be recognized as the official centres of crop plant taxonomy and cultivar description for the United Kingdom. (11). To secure the convenience of having a single centre for international correspondence, the National Institute of Agricultural Botany should be given the responsibility of maintaining the national register of cultivars and convarietal classification of cultivars originating in, or introduced into, the United Kingdom. The convarietal classifications should be a matter for consultation between the two Stations. It would be understood that in drawing up descriptions of new cultivars bred in the United Kingdom both Stations would consult whenever possible with the organizations or individuals concerned in the breeding. (12). Publications of lists of cultivar names with official descriptions should be a joint responsibility of the two official taxonomy centres in consultation. (13). If an international registration authority were to be established, then the national information would be put at its disposal.

Switzerland

320 Potato Varieties. Augus Benedikta and Maritta have been provisionally included in the 1955 list of potato varieties for Switzerland, and it is hoped that, to some extent, they will make up for the losses of Ackersegen arising from difficulties in harvesting this late-maturing variety in a wet autumn. The new varieties should be cultivated at the expense of Erdgold and Sabina which are not proving popular as eating potatoes and which are not suitable for forage because of their low starch content. Maritta, the most recently admitted variety, is of German origin. Its starch content is from 1.0 to 1.5% higher than that of Ackersegen and Voran. It comes up quickly. The tops have average resistance to mildew and virus diseases and are more susceptible to leaf roll than to mosaic disease. The tubers are slightly susceptible to mildew and common gall. The varieties Centifolia, Arran Banner and Robusta were removed from the Swiss list this autumn (1955). [See also *Fld Crop Abstr.* 8 : 938.] *Rev. rom. Agric* Oct. 1955.— D.B.

Italy

321 Irrigation in the Baraggia of Vercelli. The Baraggia is an area of Vercelli Province characterized by clay soils, low in organic matter and microbial activity. There is a project for extending irrigation in this area to most of the soils which are still arid and uncultivated and for reorganizing the distribution of water in the soils already irrigated. The irrigation water will be derived from the Dora Baltea River and new canals for its distribution are being constructed. On the newly irrigated soils preference is given to rice cultivation which is followed by a rotation including forage crops. *Riso* August, 1955.— E.B.O.

322 Centro Appenninico Terminillo. Biological Research Station in the Apennines. The Italian National Research Council, at the instigation of Prof. Carlo Jucci, set up this Station which is concerned with the pure and applied aspects of agricultural research, with special reference to mountain regions. The work so far undertaken at the Centre has been mainly concerned with the genetical study and the improvement by selection for mountain environments, of crops which are important, or potentially important, to a hill population — especially the potato and the tomato. Hill pasture improvement has also been studied, and, as a minor mountain industry, the cultivation of medicinal herbs. Those interested in the Centre should write to The Director, Prof. Carlo Jucci, Istituto di Zoologia della Università, Palazzo Botta, Pavia. *Nature, Lond.* 1 Oct., 1955.—M.H.

323 Wheat Trials in Mediterranean Countries. The Centre for the co-ordination of Wheat Experiments in Mediterranean countries has completed its second year's work. This Centre is established at the "Istituto di Genetica e Sperimentazione Agraria, N. Stramelli" at Lonigo, Vicenza. Twelve countries carried out joint trials in 1953-4. An account is given of results which, however, are not all comparable. Tables show yields, lengths of the vegetative cycle and susceptibility to rust of different wheat varieties tested in different countries. High yielding wheat varieties were Funo, Florau Mentana × *Aegilops ovata* E. and Pirana among the soft wheats, and Russello and Cappello among the durum wheats. *Agricoltura d. Venezie* July, 1955.— E.B.O.

U.S.A.

324 Biological Value of Buckwheat Protein. The results of feeding trials with rats showed that buckwheat [*Fagopyrum esculentum*] protein had a biological value approaching that of dried, whole eggs and dried, non-fat milk solids. This crop would appear to have potentialities as a dietary supplement in regions where a chronic shortage of dietary proteins with a high biological value prevails. *J. agric. fd Chem.* 1955, Vol. 3, No. 9.— P.J.B.

325 The Ninth Biennial Conference of the American Society of Sugar Beet Technologists was held in San Francisco, California, from 31 January—3 February, 1956. More than 140 tech-

nical papers were presented reporting scientific advancements in sugar-beet culture and sugar-beet processing. In the last 7 years, production of sugar-beet per acre in the U.S.A. has increased more than 20%.— C.L.S.

Venezuela

326 MINISTRY OF AGRICULTURE, CENTRE OF AGRONOMIC RESEARCH, MARACAY. A short, illustrated account of the Centre's history and present activities at Maracay and 5 sub-stations, is contained in a General Guide published in 1954, pp. 47. The Department of Plant Technology is concerned principally with the breeding and agronomy of maize, oil plants and fibre plants, and with seed production— G.M.R.

Australia

327 RECORD RICE YIELD. A 60-ac. rice crop at Yenda, on the Murrumbidgee Irrigation Area of New South Wales, yielded 4 tons [paddy] per ac., a record for machine-harvested rice. Contributory factors were the use of pure seed, the inclusion of subterranean clover in a pasture phase in the rice rotation, and favourable weather conditions. *Agric. Gaz. N.S.W.* July, 1955.— M.P.

Ceylon

328 RICE IMPROVEMENT UNIT. A joint United Kingdom and Australian Rice Mission visited Ceylon to study the present situation of the rice industry in the island. The Mission's Report (Sess. Paper No. 2, 1955) recommends the establishment of a Rice Improvement Unit within the Department of Agriculture, which would carry out research into problems associated with rice production, milling and storage, and would also operate an extension service. Close integration of rice research with the extension service is considered essential. The capital cost of the headquarters and 4 substations of the Rice Improvement Unit is estimated at approximately Rs. 4 million. In the meanwhile, greater output of rice can be achieved by the intensification of rice production in developed areas by the establishment of large-scale paddy farms on a commercial basis, possibly through private agencies or co-operative organisations, and the extension of the acreage under rice. *Trop. Agriculturist* Oct.-Dec., 1954. — M.P.

India

329 INDIAN AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI, 1905–1955. A short account of the history and work of the Institute, formerly known as the Pusa Institute, is given. New developments in this, the fiftieth year of its existence, include the completion of a laboratory for the study of trace elements and of another for cartographic work. *Amer. Sci.* 1955, **24**, No. 5, 150.— G.M.R.